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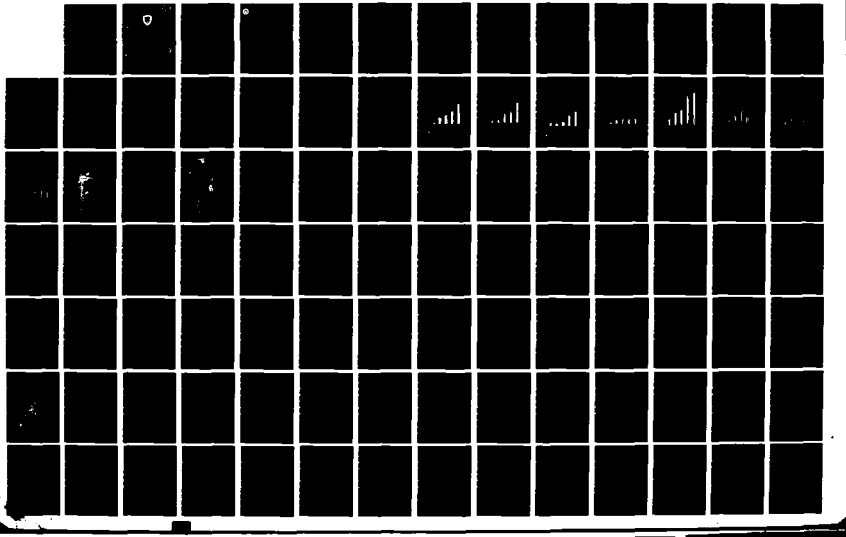

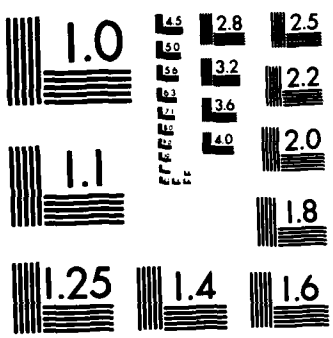

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U S ARMY

MATERIEL DEVELOPMENT AND READINESS COMMAND

MANUFACTURING METHODS & TECHNOLOGY

PROGRAM PLAN

CY 1983

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SEP 83

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This document briefly summarizes the technical work being executed or planned in the MMT Program for fiscal years 83 through 87.

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SUBJECT: 1983 DARCOM MMT Program Plan

SEE DISTRIBUTION (Appendix D)

1. Reference AR 700-90, Army Industrial Preparedness Program, para 3-4i(1), dated 15 March 1982.

2. This planning document, developed in accordance with the referenced regulation, describes the DARCOM Manufacturing Methods and Technology (MMT) Program for the period FY 83-87. This plan was completed by amending the 1982 Program Plan to take into account both programming actions which have occurred over the past year (i.e., FY 83 approvals, FY 84 apportionment submission, and FY 85 budget submission) and other Command inputs reflecting FY 86 and 87 thrusts.

3. Because of the dynamic nature of military material requirements and the constant change in technology, the inclusion of a project in this plan is not a guarantee of funding. However, the plan does indicate the current technology needs and interests of the DARCOM community.

4. A new feature has been included to assist those in the private sector. A Process Technology Index, arranged by general areas of interest—then by manufacturing process, has been added to the Appendix Section.

5. Additional copies of this document may be obtained by writing the Defense Technical Information Center, Attn: DTIC-TSR-1, Cameron Station, Alexandria, VA, 22314.

FREDERICK J. MICHEL
Director, Manufacturing Technology

1 Incl
CY1983 DARCOM
MMT Program Plan

FOREWORD

This document presents information for the DARCOM Manufacturing Methods and Technology (MMT) Program for Fiscal Years 1983-1987. The projects and funding levels for the out-years are for planning purposes only and will change based on technological developments and revisions in program requirements. Since total funding for these planned projects exceeds the projected funds for the Army's MMT Program, some projects will not be funded or may be slipped to later fiscal years. HQ, DARCOM and its subcommands and centers have the authority to reprogram funds to projects with higher priority, thereby affording the flexibility to accommodate new opportunities as they arise.

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INTRODUCTION

The MMT Program Plan

The MMT Program Plan, CY 1983, provides within a single source a summary of current and near-term efforts (FY83-FY87) included in the DARCOM MMT Program. Since weapons systems requirements and the technology for these systems are constantly changing, inclusion in the Program Plan is not a guarantee that an individual project will be funded. However, the Plan does serve as an indicator of the areas towards which DARCOM's resources will be directed and the magnitude of the Army's commitment to this program.

Organization of the MMT Program Plan

The Plan provides a section for each DARCOM element which has projects in the FY 83-87 period. Each section includes a summary of the activity, its responsibilities, and its major MMT thrust areas. Following this summary is a listing of each project proposed by that activity.

Individual project information is presented by the last four digits of the project number and includes the project title, funding, a brief description of the problem addressed by the project and the proposed solution. Projects are grouped according to broad categories and then further subdivided according to component. In addition to this grouping, a Process Technology Index has been included for the first time, to direct the reader to those projects in his technical area of interest. This cross reference (Appendix B) is arranged by technology area and then by manufacturing process. It lists the sponsoring organization, four digit project number, title, and fiscal year funding for each project. It also lists the page number where the project description can be found.

Industry Guide

An Industry Guide (Appendix A) has been included to aid in the use of the plan. The section will help clarify the interrelationships between the appropriations, commands, and personnel involved in the DARCOM MMT Program.

PROGRAM IMPACT

The MMT Program

The Manufacturing Methods and Technology (MMT) Program serves the US Army Materiel Development and Readiness Command (DARCOM) as a bridge between research and development and production. The program's primary aim is to reduce the cost of weapons system acquistion by improving the efficiency of manufacturing processes and by implementing new technology. Although cost reduction is a primary concern, the emphasis is also directed toward efforts reducing air and water pollution, increasing safety, conserving energy, reducing dependency on critical material, improving producibility and increasing productivity.

Need for MMT

The United States is currently in a period of low productivity growth resulting in increased product costs. The MMT Program is a major DOD tool to improve productivity and lower end item and spare/repair parts costs. The following excerpts illustrate the emphasis being given to the MMT Program by DOD and Department of Army.

Excerpt from the "Annual Report to the Congress, Fiscal Year 1984" by The Honorable Caspar W. Weinberger, Secretary of Defense:

> "The Manufacturing Technology Program is a broad based program designed to improve the productivity and responsiveness of the defense industrial base. Investments made by this predominately procurement funded program are expected to result in factory floor applications of productivity-enhancing technology. This program will continue to receive priority emphasis."

Excerpt from "The FY 1984 Department of Defense Program for Research, Development, and Acquisition" by the Honorable Richard D. DeLauer, Under Secretary of Defense, Research and Engineering to the 98th Congress, First Session, 1982:

> "The Manufacturing Technology Program is a broad-based program designed to improve the productivity and responsiveness of the defense production base. In FY 1983 the Congress moved the Army's portion of this program to the RDT&E appropriation. We believe it should continue to be predominantly procurement funded because investments are expected to result in first-case "factory floor" applications of advanced productivity enhancing technology."

Excerpts from "Increasing Productivity - The Continuing Challenge," remarks delivered by Alton G. Keel, Associate Director for National Security and International Affairs, Office of Management and Budget to the Reliability and Maintainability Symposium, 25 January 1983:

> "A key element of the ManTech Program today is its 'cost driver conferences,' where representatives from various defense industries get together to identify subsystems of a defense system that drive the system's cost, e.g., the propulsion, airframe, drive system, rotor and so forth in a helicopter and identify potential initiatives to reduce the ultimate costs of the finished system. Both the Defense Department and OMB are strong supporters of the ManTech effort."

While the program does receive strong support from all levels within DoD, other factors involving political, administrative, and priority considerations can impact the level of funding ultimately received for the program. For example, in 1978, the General Accounting Office (GAO) reviewed the MMT Program. Their report, entitled, "The Department of Defense Manufacturing Technology Program - A Tool for Improving Productivity That Needs Sharpening" was issued in 1979 and recommended no further increases in the program until certain improvements were made. More recently, another congressionally requested survey of the Defense Department's Manufacturing Technology, Technology Modernization, and Industrial Productivity Improvement Programs began in October of 1982. The current focus of the GAO audit is on DoD's response to the audit conducted in 1979. In addition, the GAO is reviewing the effect of these programs on defense contractor productivity and cost reduction. Preliminary findings and recommendations are expected in late 1983.

Another example which could impact future MMT funding was the congressional decision for FY 83, that the MMT program be funded out of the R&D account. Even though the technical content and goals of the program were supported, the net result of the administrative transfer to the R&D account was a $50-$70 million cut in the FY 83 program. Action has been on-going throughout FY 83 to attempt to keep future MMT programs within the Procurement account. As an example of those actions, the excerpts below are from a 10 June 1983 letter from the Honorable Richard D. DeLauer, Under Secretary of Defense, Research and Engineering to the Honorable Joseph P. Addabbo, Chairman, Subcommittee on Defense, Committee on Appropriations, House of Representatives.

> "Late in the review of our FY 83 budget request, your Committee recommended deleting the Army's entire $120 million Manufacturing Technology Program because it was 'research in nature and should not be funded in the procurement appropriations.' The Committee supported the program but recommended it be conducted 'within the available research and development appropriations.' We disagree with this view and the Secretary of Defense included the issue in his major issues letter to the Conference Committee Chairmen. Eventually, $50 million was restored to the Army but in the RDT&E appropriation.

"The purpose of the Manufacturing Technology Program is to provide advanced, generic manufacturing technology to improve the productivity and responsiveness of the defense industrial base. It is 'engineering work.' But, it is 'engineering work' associated with production. While one could engage in philosophical discussions of the merits of funding it from RDT&E, I believe the pragmatic view dictates this program should be budgeted for and managed by that part of the organization most closely associated and most familiar with the production of our weapons systems - the procurement appropriations infrastructure. This view was supported by the March 1980 report of the HAC Surveys and Investigations Staff. Therefore, we have again included the majority of our FY 84 Manufacturing Technology Program budget request for all three Military Departments in the procurement appropriations. I urge the Committee to support this view.

"I request your personal involvement in this issue for I am told your Committee's staff has suggested they will not only take adverse action, again, against the Army's FY 1984 Manufacturing Technology Program but will also do so against the Navy and Air Force programs. I believe this would not be in the best interest of the DoD nor of the nation."

New Systems

The United States has the greatest technological capability and one of the strongest industrial bases in the world. The MMT program is necessary to support the industrial base being established for the new weapons systems required to modernize our forces and improve our readiness in the 1980's. These new systems will perform a variety of offensive and defensive missions, from the national command center to the forward edge of the battlefield. Highlights of the Army's research, development, and acquisition effort that illustrate the direction and importance of our equipment modernization programs follow:

The nucleus of maneuver on the modern battlefield is the tank. While the M60A3 is a good tank that will be in our inventory well into the 1990's, its potential for improvement is limited, and it can be outperformed by two Soviet tanks that have already been fielded. The Army recognizes the adequacy of the M60A3 for many missions, and we continue to modify the older M60A1s to the A3 configuration. The Army's tank of the future is the M1 Abrams. Its militarily significant difficulties have been corrected. We also plan to procure light armored vehicles for light divisions. These vehicles will fill the need for an armored vehicle that can be moved rapidly and fight effectively in nearly any contingency area.

Experience shows that the tank cannot be used to its full potential unless it is employed with infantry, and for many years the US Army has not had a modern infantry fighting vehicle. That condition changes with the Bradley fighting vehicles (BFV), which were produced in FY 83 at a rate of between 40 and 50 per month.

When our armored and mechanized divisions have both the infantry and cavalry versions of the BFV, the number of tube-launched, optically-tracked, wire-guided (TOW) missile launchers mounted on vehicles will increase from 282 to nearly 800 in each heavy division. These increases provide great advantages on any battlefield where we are opposed by tanks or other armored vehicles.

The potential of the tank is improved in the defense when its vulnerability to opposing tank and antitank weapons is reduced by tactical means and by fighting from prepared (dug-in) positions. The M9 armored combat earthmover, which entered production in FY 83, was specifically designed to move with armor and dig protective positions.

Tank killers are a vital part of close combat. One of our most formidable tank killers, the Apache attack helicopter, equipped with the Hellfire laser-guided missile system, is entering its second year of production. The Apache is the Army's first day-night, all-weather, all-terrain, self-deployable attack helicopter.

The combat effectiveness of the Apache/Hellfire combination will be improved by the Army Helicopter Improvement Program's near term Scout, whose role is reconnaissance, target acquisition, and target designation. It is called an improvement program and "near term" because the procurement strategy involves the modification of existing OH-58A Scout airframes so that a more capable Scout can be fielded quickly and economically. Initial production is scheduled for FY 84.

Our infantry anti-armor capability over the past 15 years has depended largely on three systems: the light antitank weapon (LAW), Dragon, and the TOW antitank missile. Improved Soviet armored vehicles have reduced the relative effectiveness of these systems. Hence, we need to restore the edge to our infantry. Viper, replacing the LAW as the soldier's portable, close-in anti-armor weapon, provides greater reliability, range, and hit probability. The Dragon is currently our mid-range (1,000 meters) antitank weapon. It is no longer being produced, but it will remain in service until we develop a replacement system.

The TOW long-range (3,750 meters) anti-armor system is a prime example of evolutionary development. The basic TOW was developed to counter the armor threat of the 1960's, and the Improved TOW followed to counter the threat of the late 1970's. TOW 2, now approved for production, will match the threat into the late 1980's and will provide a potent anti-armor weapon for the Bradley fighting vehicles, the Cobra attack helicopter, and vehicle mounted and ground launchers.

Antitank mines, which impede and channel enemy armor, will be emplaced more rapidly by the trailer-mounted Ground Emplaced Mine Scattering System (GEMSS); production of this system continues.

In the fire support area, our artillery modernization is continuing with both new weapons and munitions. The Multiple Launch Rocket System (MLRS) will provide concentrated firepower at ranges greater than 30 kilometers. A new 155-millimeter nuclear projectile is under development. A new enhanced radiation (ER) 8-inch artillery-fired atomic projectile (AFAP), which has significant operational advantages over the presently deployed 8-inch atomic projectile, is currently in production, and a new ER warhead is in production for the Lance missile system.

The area denial artillery munition (ADAM) and remote anti-armor munition (RAAM), both in production, provides a new capability t employ mines against personnel and vehicular targets in enemy controll areas. Fired from 155-millimeter howitzers, these mines permit the com ier to fix objectives, isolate targets, interdict advancing columns, cl gaps in minefields, lay point minefields, and reinforce other obstacl

The Pershing II missile system will provide longer range, ter reaction time, and greater accuracy than its predecessor, Pershing IA. Pershing II will fill a critical void in the NATO long-range theater nuclear force.

In the late 1980's, our fire support capability will be improved by a precision guided munition (PGM) called sense and destroy armor (SADARM). The SADARM projectile, which can be fired from an 8-inch howitzer, contains sensing submunitions that are ejected over a target area. After the submunition detects a target, its warhead is fired at the relatively soft top of the target. This technology offers a fire and forget, day/night capability and is relatively immune to weather, battlefield obscurants, and electronic countermeasures. Similar PGMs are being considered for use with MLRS.

While cannons, rockets, missiles, and munitions constitute the most visible components of the fire support team, the effectiveness of weapons is limited unless targets can be accurately identified and quickly engaged. Our field artillery responsiveness has been greatly improved by the continued fielding of the Tactical Fire Direction System (TACFIRE), an automatic data processing system that integrates various means of target acquisition with meteorological and other data. Testing of the Meteorological Data System (MDS) will be completed. This system will assist in adjusting artillery by accounting for changing atmospheric conditions.

For many years, our air defense needs have been well served by I-Hawk, Chaparral, Vulcan, Redeye, and Nike Hercules. Our capability for the future will be significantly bolstered by the addition of four new systems: Stinger, the division air defense (DIVAD) gun, Patriot, and truck-mounted Roland fire units. Stinger, a manportable, hand held air defense weapon, was fielded in Europe in 1981, and an improved version with a more capable seeker is under development. DIVAD will provide our maneuver elements with a significantly improved forward air defense

capability. Patriot is without doubt the best air defense system in the world. In FY 83, 12 Patriot fire units were funded, and the first Patriot battalion became operational. Even though the major program was terminated in FY 82, we intend to field one light Roland battalion to support the Rapid Deployment Force.

Short range air defense command and control (SHORAD C^2) is currently being developed to improve the probability of successfully engaging hostile air targets. SHORAD C^2 will replace a manual system, increase our ability to identify aircraft, and ensure the timely and dependable transmittal of engagement data.

The $23 million appropriation in FY 81 to construct phase I (for production of 155-millimeter GB-2 artillery projectiles) of the integrated binary munition production facility (IBMPF) at Pine Bluff Arsenal, Arkansas was the first step toward modernizing our aged and inadequate deterrent/retaliatory stockpile of chemical munitions.

This effort is essential if we are to achieve a credible chemical deterrent, a deterrent that is critically needed when viewed in the context of the Soviet Union's formidable and expanding offensive capability to wage chemical warfare and their willingness to use this capability as evidenced in Afghanistan. Furthermore, the very real potential exists, as a result of the linking of lethal mycotoxins to the "yellow rain" attacks in Southeast Asia, that the Soviets are using biological weapons in direct violation of the Biological Weapons Convention and the Geneva Protocol. We strongly prefer verifiable chemical and biological disarmament agreements, but in their absence, we need a credible chemical stockpile to deter others from using chemical and biological weapons against us or our allies.

Although command, control, and communications (C^3) form the central nervous system for a fighting force, we do not have a tactical radio capable of operating satisfactorily in an electronically hostile environment. The Single Channel Ground and Airborne Radio System (SINCGARS) will provide our soldiers with a jam resistant, secure radio system capable of operating in future combat environments. Testing of two candidate radios will result in a production decision early in FY 84. The Joint Tactical Communications program--also known as tri-services tactical communications (TRI-TAC) will replace today's analog communications systems, which have manual switchboards, unsecure telephones, and unreliable teletypewriters.

The Tactical Satellite Communications (TACSATCOM) Program takes advantage of our Nation's space technology and will provide a highly reliable means of communication to our tactical and theater nuclear forces. This system and the Position Location and Reporting System/Joint Tactical Information Distribution System hybrid, essential for position location and data distribution in our divisions, continue to be supported in research and development. The addition of these capabilities in our C^3 inventory will add significantly to the capabilities of our field forces.

The Army will continue to benefit from the addition of new aviation and ground systems. The Black Hawk helicopter is being fielded to priority units in Europe. Modernization of the Chinook to the CH-47D configuration has been accelerated. Twenty-four aircraft were modernized in FY 83, and production will accelerate to 60 per year in FY 84, thereby completing the total procurement 4 years early.

With regard to ground mobility, an area critical to the support of continued Army modernization, improved 5-ton trucks, new 10-ton heavy expanded mobility tactical trucks (HEMTT), the off-the-shelf commercial utility and cargo vehicles (CUCV), and commercial construction equipment are being procured. The M939 series 5-ton vehicle will support the introduction of such major systems as the M1 Abrams tank, Patriot, Pershing II, and TACFIRE. The 10-ton HEMTT will support the MLRS and Patriot, as well as provide unit ammunition and fuel transport services to the corps area. The CUCVs and high mobility multi-purpose wheeled vehicles (HMMWV) will replace four separate overage and less capable vehicle families.

The Army continues to research advanced systems, including the Corps Support Weapon System, the mobile protected gun and a terminally guided warhead for the Multiple Launch Rocket System. Also, significant new initiatives are planned for a lightweight air defense system and laser weapons and to improve the combat capabilities and reliability of some major systems already fielded: the TOW anti-armor missile, the Chaparral air defense missile, and the Abrams tank.

Planning Synopsis

Expenditures planned by the DARCOM Major Subordinate Commands approach $705 million during the five year period. Starting at approximately $40 million in FY 83, the planned annual funding level increases more than five fold at the end of the period.

The Army MMT Program is controlled by a standard accounting system which contains eight different appropriations. In some cases, several of the commands share an appropriation. For example, the Communications/ Electronics appropriation is used by three commands: CECOM, DESCOM, and ERADCOM. The distribution of the appropriations among commands is shown in the first table that follows and the level of planned expenditures within each appropriation is illustrated by the second table.

The third table offers a critique of planning process by showing the ratio of projects that were included in previous years' Program Plans to those projects that are currently in the FY 84 Apportionment and FY 85 Budget review cycles.

SUBMACOM SUBMISSION TO MMT PROGRAM
BY COMMAND (Thousands of Dollars)

Command	Appropriation	Fiscal Code	FY 83	FY 84	FY 85	FY 86	FY 87
AMCCOM	Ammunition	4250	10129	23794	28634	56027	60754
	Weapons	3297	3635	9623	11069	10590	10890
	Other Support	5397	1473	7232	8396	8502	4000
AVRADCOM	Aircraft	1497	3951	11490	28755	29943	44358
CECOM	Communications/Electronics	5297	1329	2623	4820	5500	9350
DESCOM	Tracked Combat Vehicles	3197	691	3960	2499	2662	2179
	Tactical & Support Vehicles	5197	505	525	1280	596	0
	Communications/Electronics	5297	50	370	0	0	0
ERADCOM	Communications/Electronics	5297	5944	12901	9013	11555	8045
DARCOM/AMMRC	Other Support	5397	2270	5970	6500	6850	6750
MICOM	Missiles	2597	3050	5750	22816	24301	39190
	Other Support	5397	240	1000	900	1000	0
	Ammunition	4250	0	0	580	400	1775
	Aircraft	1497	0	0	0	0	400
MERADCOM	Other Support	5397	0	1489	3166	1900	1800
TACOM	Tracked Combat Vehicles	3197	5111	8758	15421	21835	25650
	Tactical & Support Vehicles	5197	795	3705	6245	2325	1775
TECOM	Other Support	5397	438	1100	1200	1300	1400
TSARCOM	Aircraft	1497	0	1000	4000	2000	2900
	TOTAL		39,611	101,290	155,294	187,286	221,216

This table shows the planned expenditures for each fiscal year in the planning period. The "Command" Column identifies the DARCOM Major Subordinate Commands and Activities which participate in the MMT Program.

SUBMACOM SUBMISSION TO MMT PROGRAM
BY APPROPRIATION (Thousands of Dollars)

Appropriation	Fiscal Code	FY 83	FY 84	FY 85	FY 86	FY 87
Aircraft	1497	3951	12490	32755	31943	47658
Missiles	2597	3050	5750	22816	24301	39190
Tracked Combat Vehicles	3197	5802	12718	17920	24497	27829
Weapons and Other Combat Vehicles	3297	3635	9623	11069	10590	10890
Ammunition	4250	10129	23794	29214	56427	62529
Tactical and Support Vehicles	5197	1300	4230	7525	2921	1775
Communications/Electronics	5297	7323	15894	13833	17055	17395
Other Support Equipment	5397	4421	16791	20162	19552	13950
	TOTALS	39,611	101,290	155,294	187,286	221,216

This table shows the planned expenditures for each fiscal year in the planning period. The "Appropriation" column identifies the various Procurement Appropriations established by the US Congress as a standard accounting system.

ANALYSIS OF PREVIOUS PLANNING DATA

CY of Plan	Period Covered*	Percent of Submission Previously Planned	
		FY84 Apportionment	FY85 BUDGET
1978	FY80 - FY84	11.0%	6.6%
1979	FY79 - FY83*	15.6%	8.6%
1980	FY80 - FY84	37.6%	21.1%
1981	FY81 - FY85	50.0%	28.6%
1982	FY82 - FY86	72.6%	45.1%

This table shows the percentage of projects that are currently in the fiscal review cycles and that were planned in previous years' long range plans. It illustrates the improved planning accuracy that naturally occurs as the planning process and the budgeting process converge.

*Starting in 1979, the planning period covered was changed to reflect the more immediate future, rather than the POM years.

Industrial Productivity Improvement (IPI) Program

Interim policy guidance and procedures regarding the use of financial resources for implementing programs of this nature were issued to the Army and other Military Departments by an Office of the Secretary of Defense (OSD) Memorandum on 17 June 1983. The OSD Memo defined the Industrial Modernization Incentives Program (IMIP) to include those programs known as IPI and Technology Modernization (TECHMOD). This guidance was provided pending formal publication of a DoD Directive covering the IMIP concept.

OSD defines IMIP as an integrated contractual business and technical approach to improve contractor productivity and responsiveness through capital investment and/or improved engineering management and advanced manufacturing technology applications. Contractors will be encouraged to conduct IMIP efforts without direct government funding. However, when it is in the best interests of the government, direct government funding may be provided from the individual acquisition programs involved, or from the appropriate categories of Program Element 78011, Industrial Preparedness. Other than direct government funding, among the incentives that may be used for IMIP are shared productivity savings, contractor investment protection, performance incentives, award fees and advance agreements pursuant to depreciation of tangible capital assets.

IMIP normally will be accomplished in three phases: Phase I - a top down structured factory analysis which culminates in a strategic plan to modernize the factory and a contract arrangement between the DoD contractors and DoD, containing incentives for capital investment; Phase II - the manufacturing engineering of enabling technologies and the development of the detailed implementation plan; and Phase III - the investment and implementation of the proposed improvements.

OSD restricts the application of the Manufacturing Technology appropriations as a source of IMIP funding. Only those activities, occurring during Phase II of the program, that will advance the manufacturing state-of-the-art meet the qualifying criteria. This indicates a new economically viable production technology will be established. The simple tailoring of off-the-shelf technology and/or equipment to a specific application will be funded from another source. Furthermore, it is expected that the newly established technology will be applied to a number of weapons systems being produced by the factory and that it is needed by and will be transferred and used in other factories.

The OSD Memo became effective with the budget estimate submission from the Military Departments for FY 85 and onwards. The forecasted IPI Program as depicted by this Program Plan is based on the unrestricted planning and programming procedures in practice before the OSD Memo was issued.

The following table and charts illustrate the size and direction of the IPI Program during the planning period. They reveal an unrestricted funding level which may cover a range of Phase I and II activities that are now beyond the bounds of the current guidance.

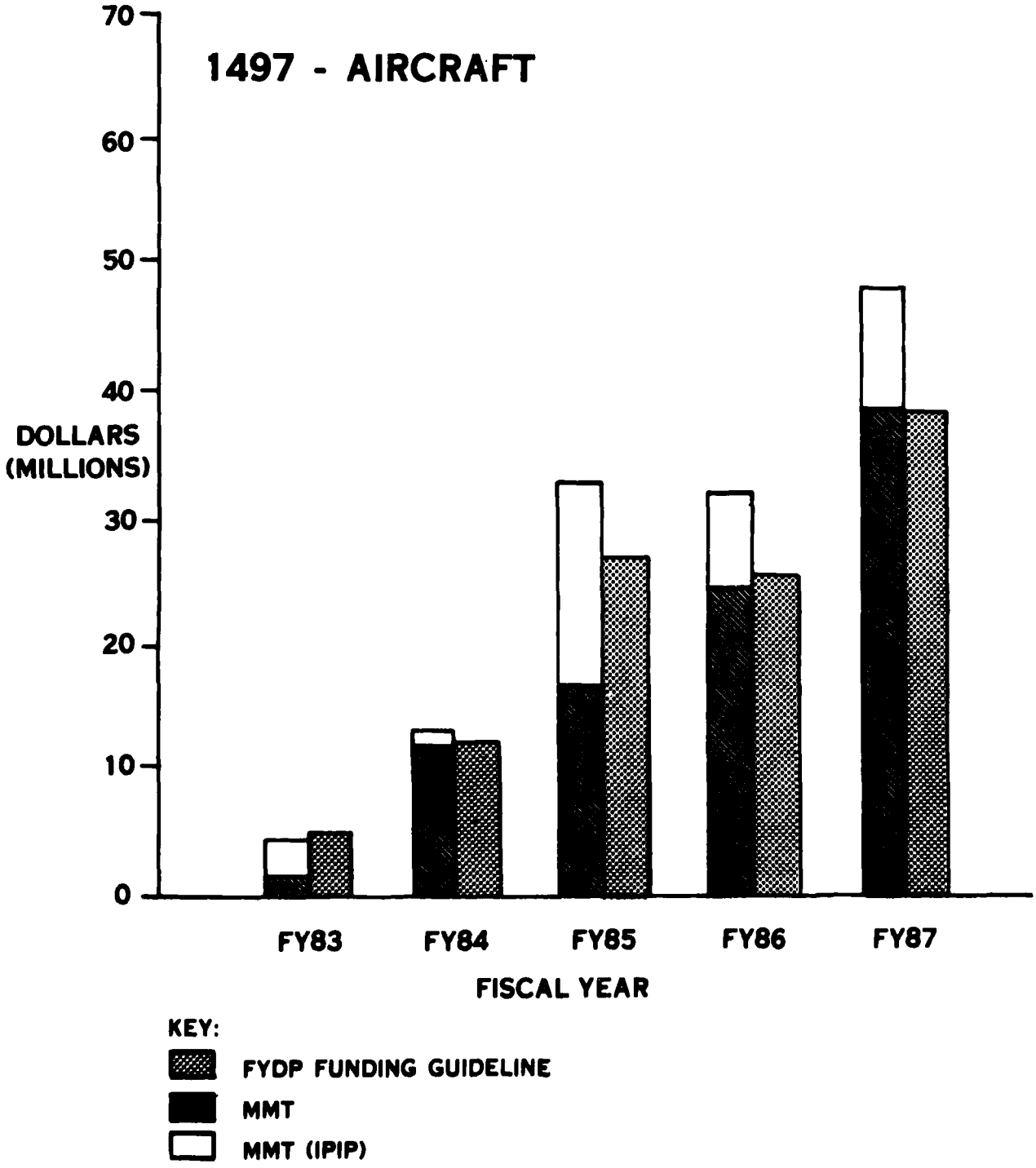
The first table highlights the portion of planned program specified for IPI. Only those fiscal accounts where there are planned IPI efforts are shown. No IPI efforts are currently planned using fiscal codes 3297, 4250, or 5397. Parenthetical entries denote the value of these efforts in comparison to the entire MMT Program. The scope of effort and level of planned expenditures are significant in the aircraft and tracked vehicle production bases.

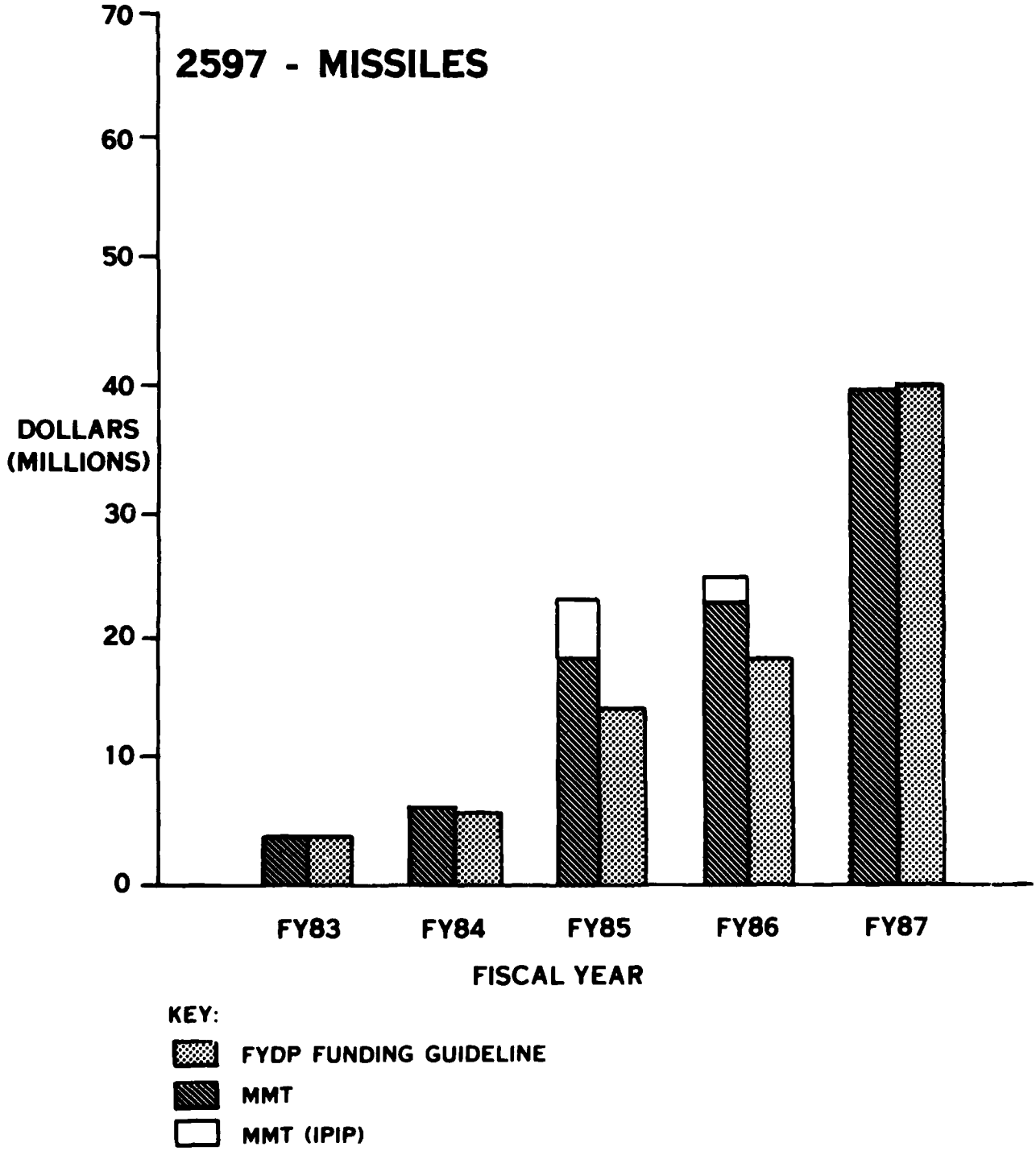
The bar charts illustrate the tabular funding data graphically. Here, the total planned MMT Program and the planned IPI efforts are compared with funding guidelines established by the Five Year Defense Plan (FYDP) Procurement Annex, FY 84 President's Budget, dated January 1983.

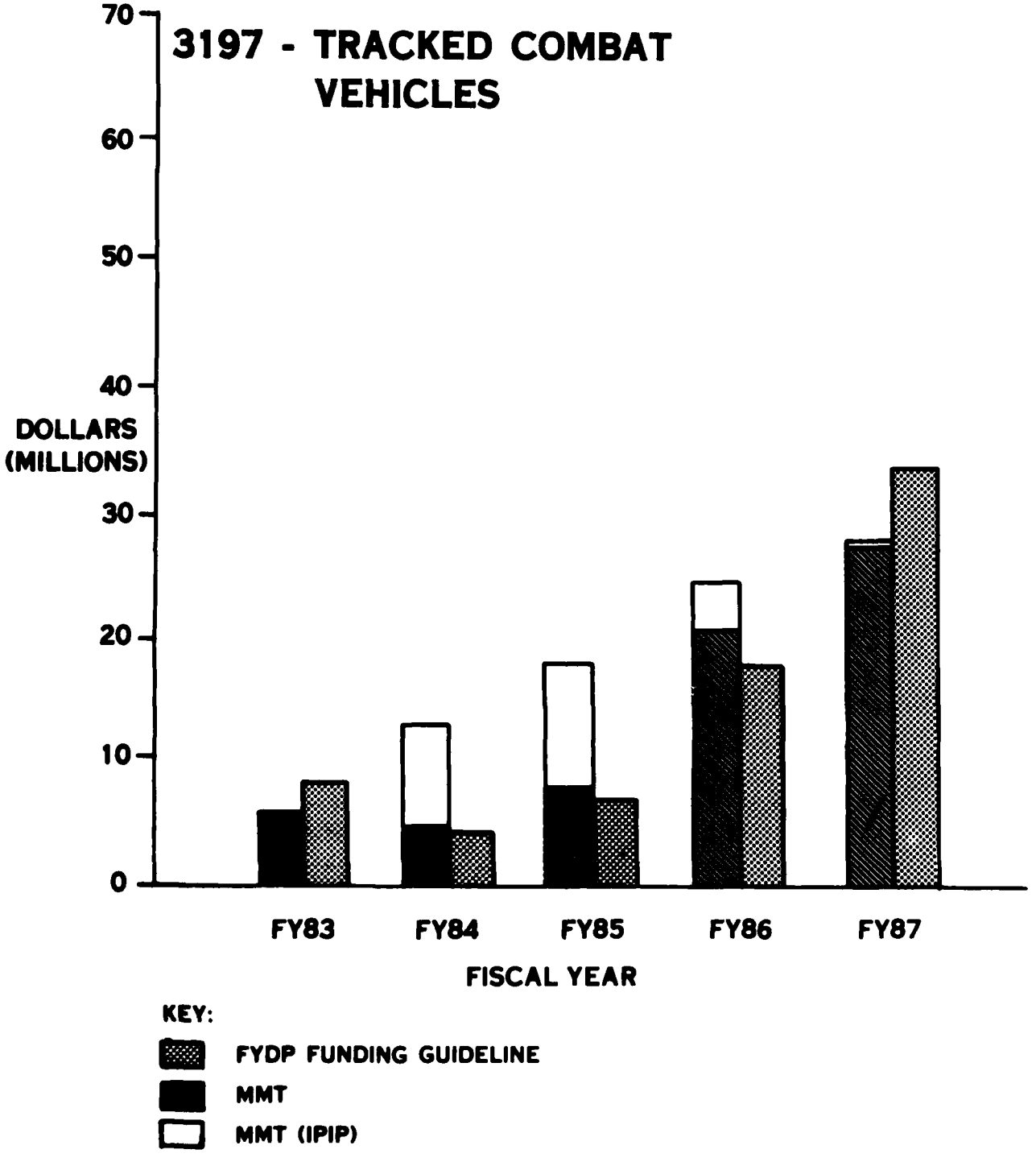
INDUSTRIAL PRODUCTIVITY IMPROVEMENT PROGRAM FUNDING BY APPROPRIATION (Thousands of Dollars)

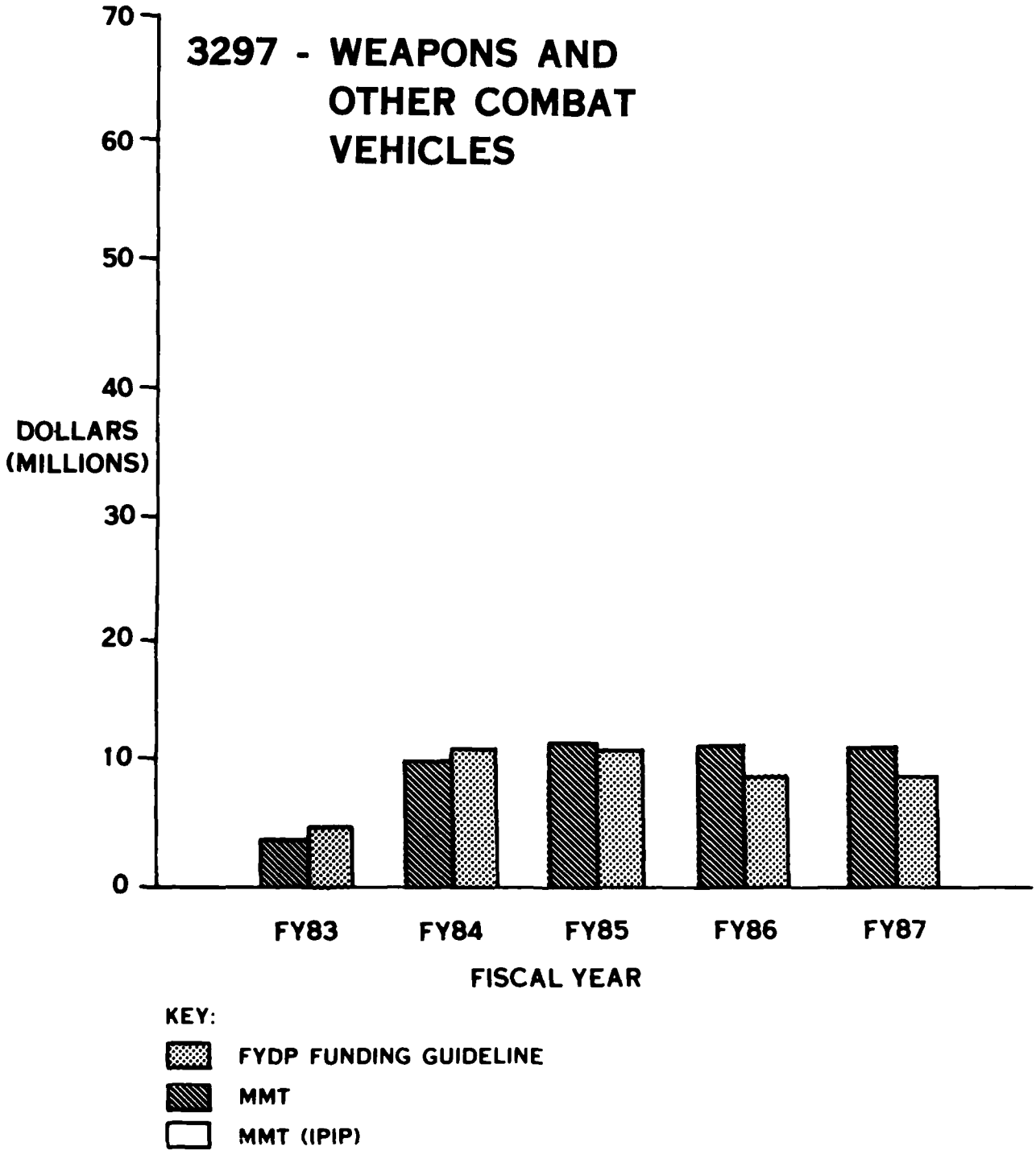
Appropriation	Fiscal Code	Command	FY 83	FY 84	FY 85	FY 86	FY 87
Aircraft	1497	AVRADCOM	3951	11490	28755	29943	44358
			(2700)		(12500)	(6000)	(7000)
		MICOM					400
		TSARCOM		1000	4000	2000	2900
				(1000)	(4000)	(2000)	(2900)
		TOTALS	3951	12490	32755	31943	47658
			(2700)	(1000)	(16500)	(8000)	(9900)
Missiles	2597	MICOM	3050	5750	22816	24301	39190
					(5000)	(2000)	
Tracked Combat Vehicles	3197	DESCOM	691	3960	2499	2662	2179
				(3200)	(2200)		
		TACOM	5111	8758	15421	21835	25650
			(176)	(5200)	(8145)	(3800)	(700)
		TOTALS	5802	12718	17920	24497	27829
			(176)	(8400)	(10345)	(3800)	(700)
Tactical and Support Vehicles	5197	DESCOM	505	525	1280	596	
		TACOM	795	3705	6245	2325	1775
				(1800)	(2000)	(650)	(500)
		TOTALS	1300	4230	7525	2921	1775
				(1800)	(2000)	(650)	(500)
Communications/Electronics	5297	CECOM	1329	2623	4820	5500	9350
			(1054)	(1222)	(1000)		(500)
		DESCOM	50	370			
		ERADCOM	5944	12901	9013	11555	8045
			(893)	(1500)			
		TOTALS	7323	15894	13833	17055	17395
			(1952)	(2722)	(1000)		(500)

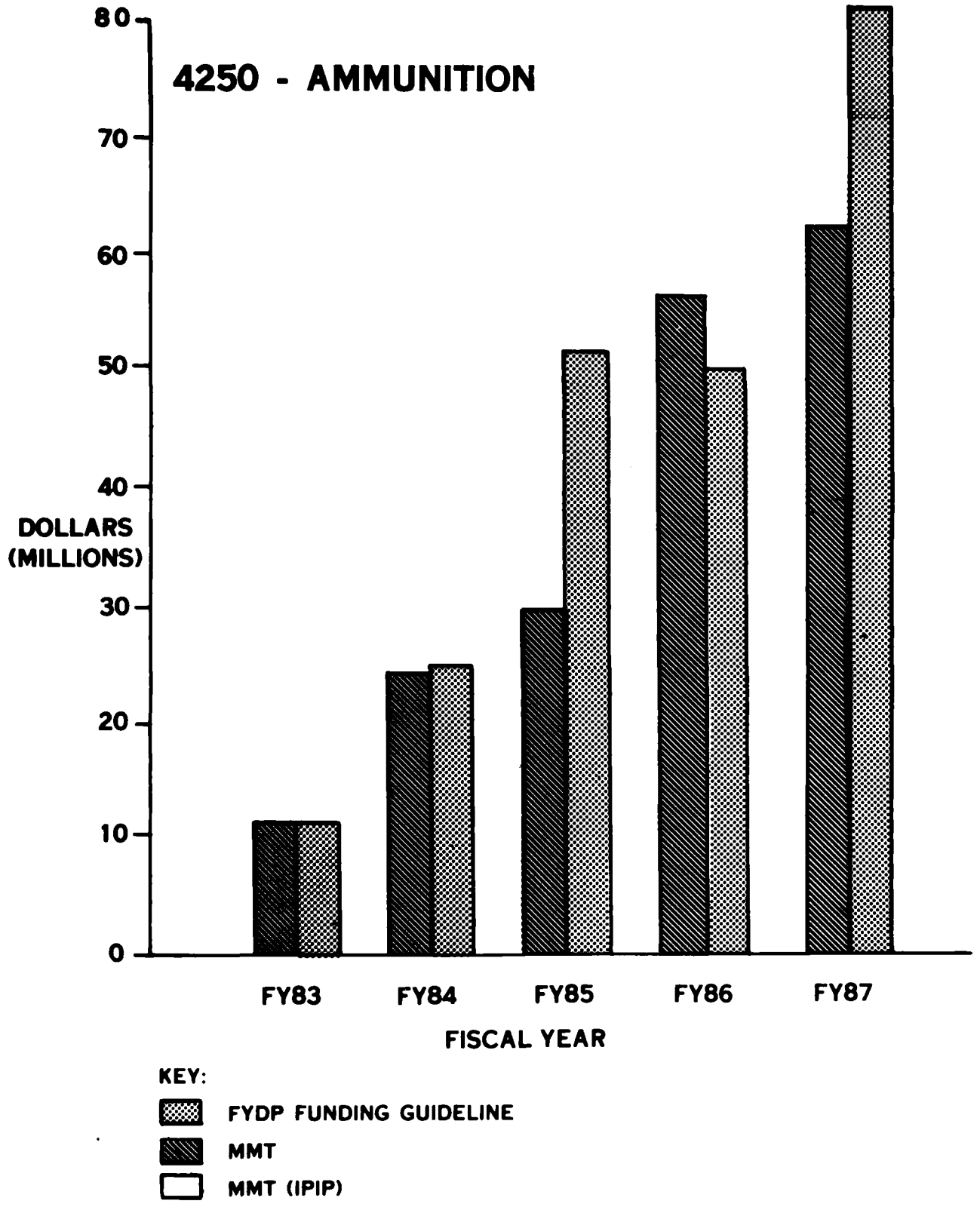
NOTE: The Industrial Productivity Improvement Program share in the MMT Program is shown in parenthesis.

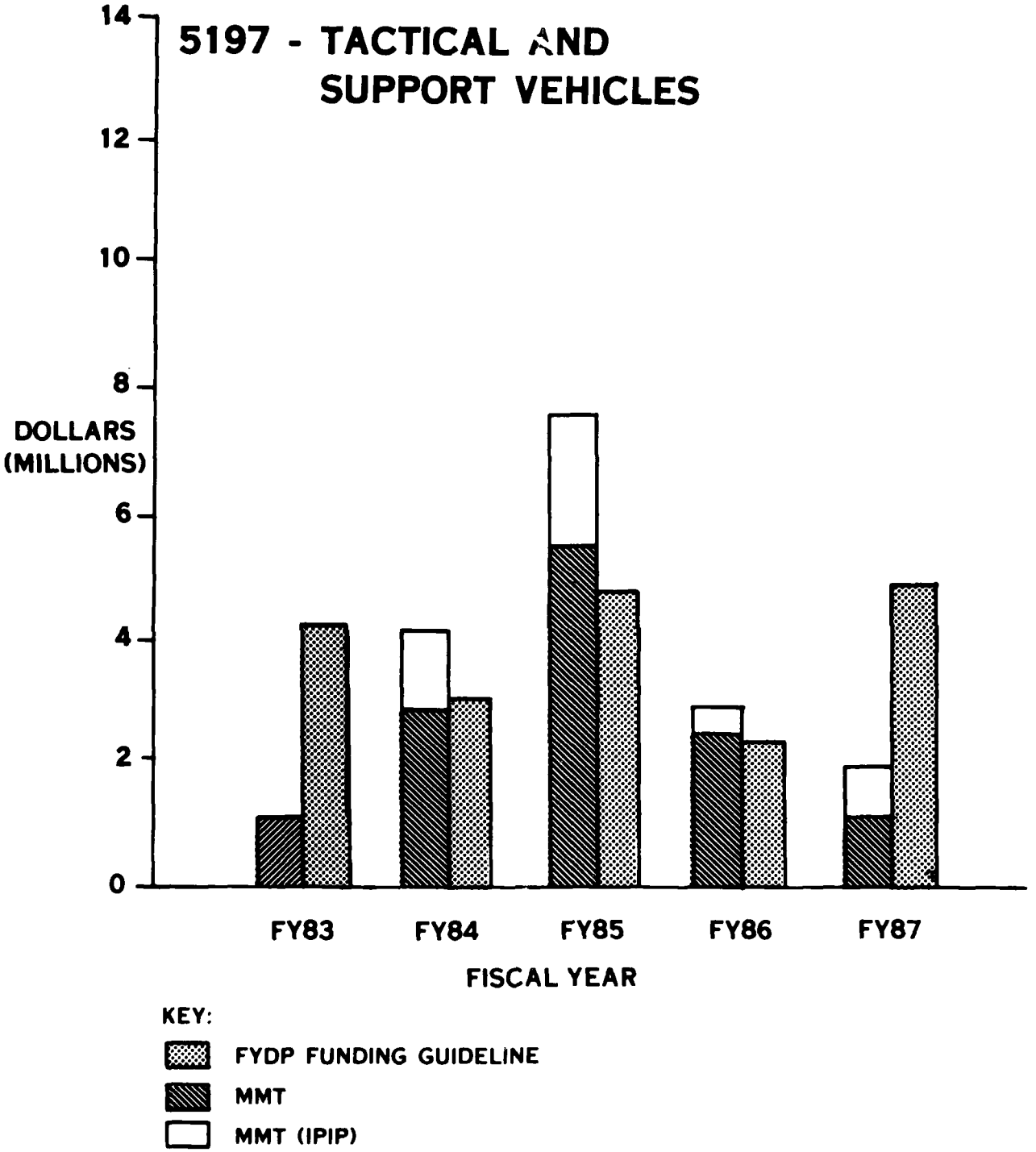

1497 - AIRCRAFT
70
60
50
40
30
20
10
0
DOLLARS (MILLIONS)
FY83
FY84
FY85
FY86
FY87
FISCAL YEAR
KEY:
FYDP FUNDING GUIDELINE
MMT
MMT (IPIP)

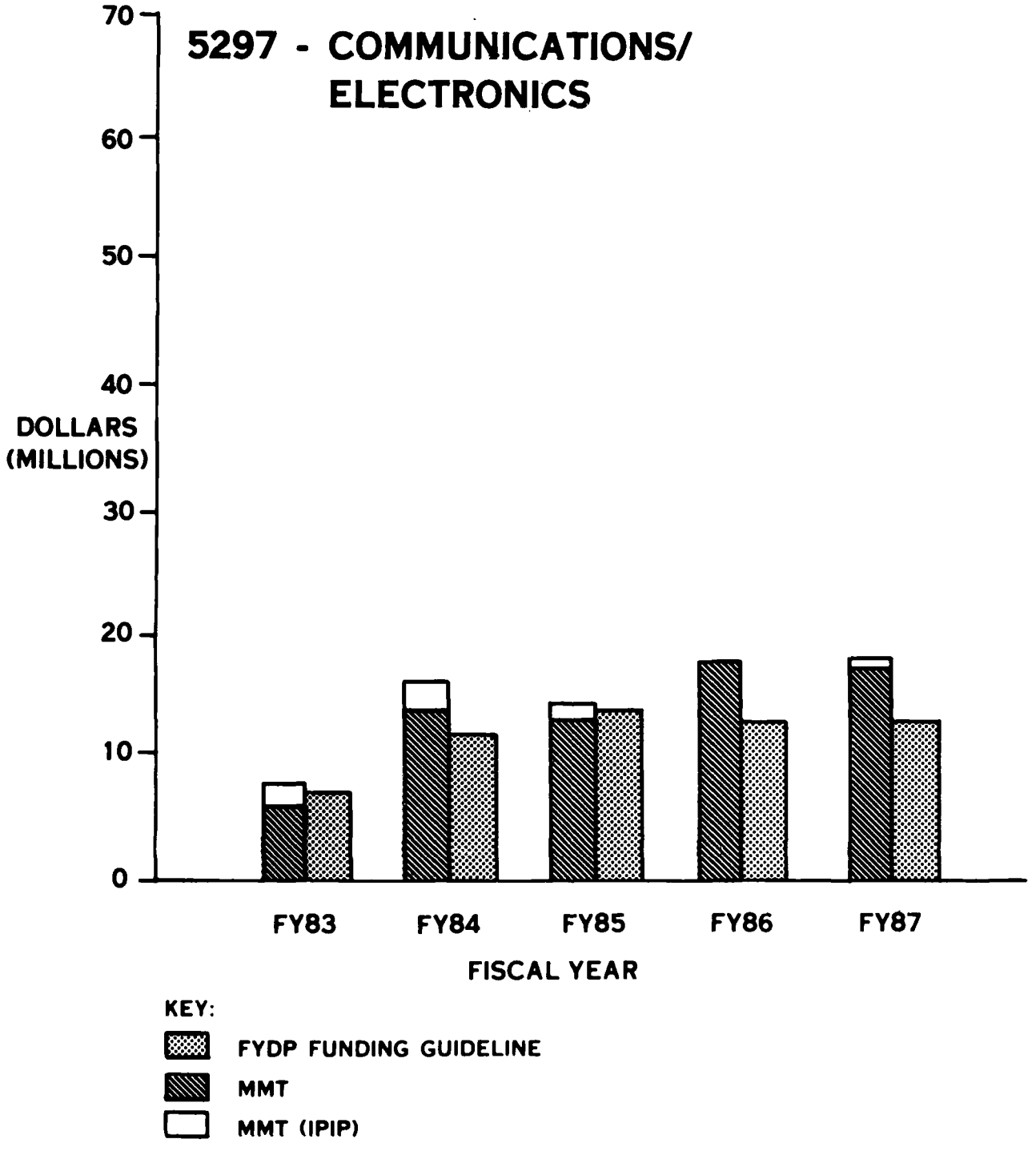

2597 - MISSILES
70
60
50
40
30
20
10
0
DOLLARS (MILLIONS)
FY83
FY84
FY85
FY86
FY87
FISCAL YEAR
KEY:
FYDP FUNDING GUIDELINE
MMT
MMT (IPIP)

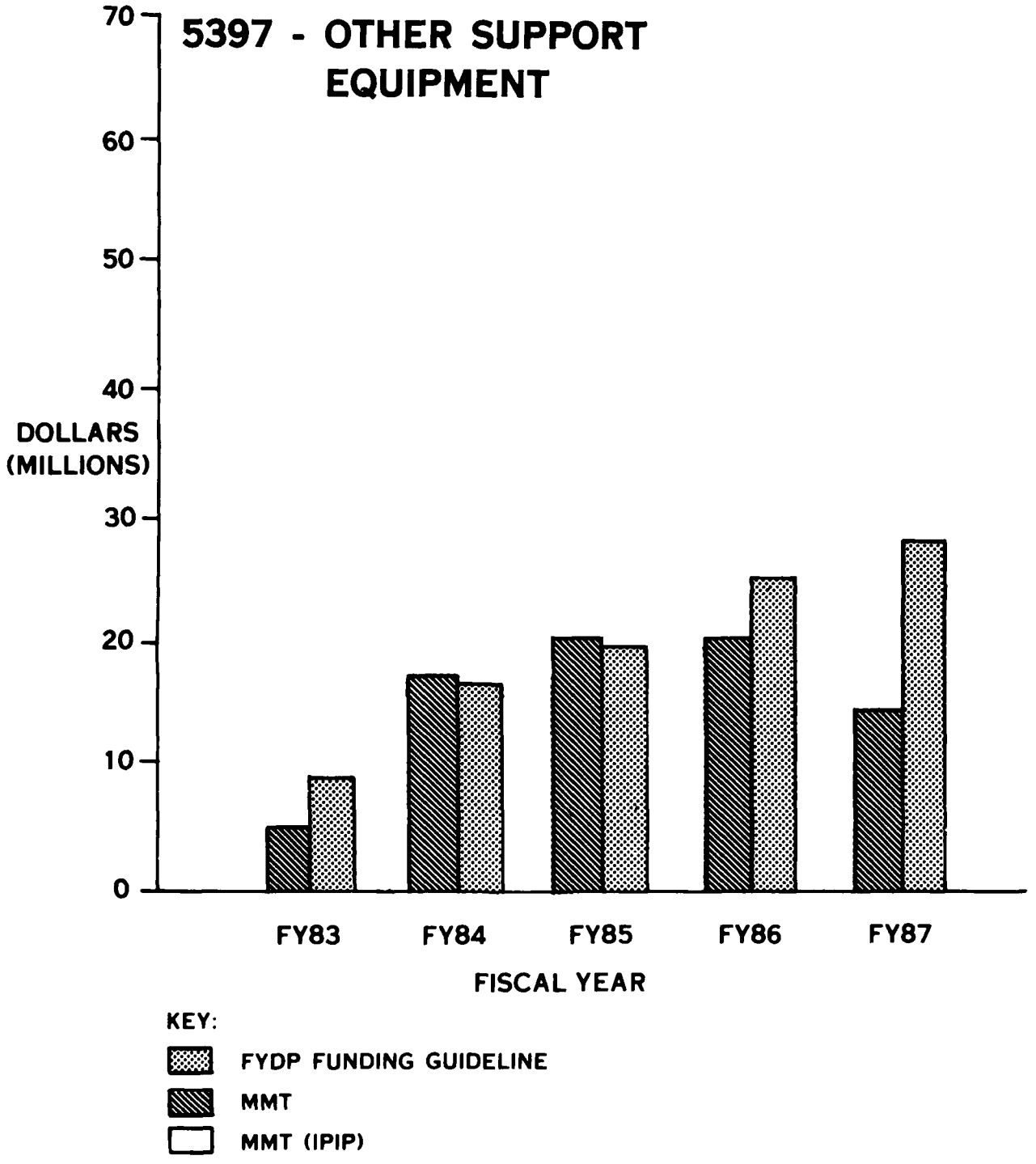

3197 - TRACKED COMBAT VEHICLES
70
60
50
40
DOLLARS (MILLIONS)
30
20
10
0
FY83
FY84
FY85
FY86
FY87
FISCAL YEAR
KEY:
FYDP FUNDING GUIDELINE
MMT
MMT (IPIP)

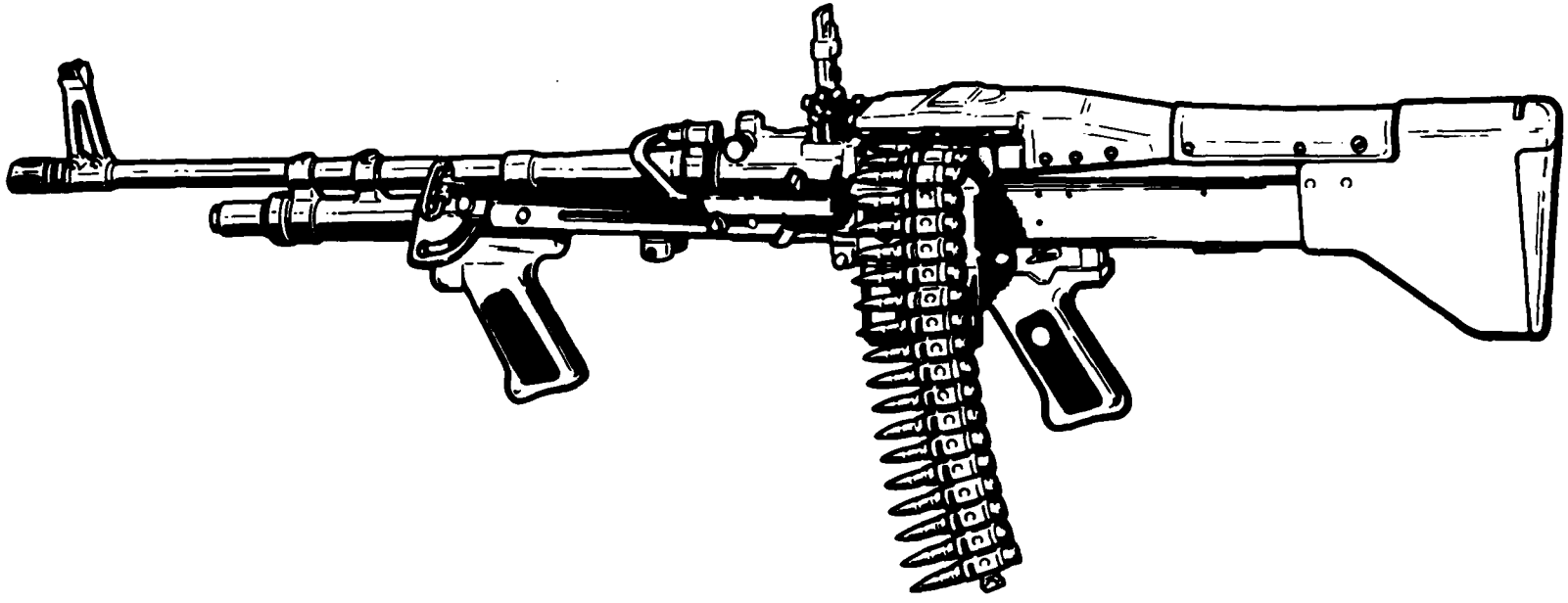

3297 - WEAPONS AND OTHER COMBAT VEHICLES
70
60
50
40
30
20
10
0
DOLLARS (MILLIONS)
FY83
FY84
FY85
FY86
FY87
FISCAL YEAR
KEY:
FYDP FUNDING GUIDELINE
MMT
MMT (IPIP)


4250 - AMMUNITION
80
70
60
50
40
30
20
10
0
DOLLARS (MILLIONS)
FY83
FY84
FY85
FY86
FY87
FISCAL YEAR
KEY:
FYDP FUNDING GUIDELINE
MMT
MMT (IPIP)


5197 - TACTICAL AND SUPPORT VEHICLES
14
12
10
8
6
4
2
0
DOLLARS (MILLIONS)
FY83
FY84
FY85
FY86
FY87
FISCAL YEAR
KEY:
FYDP FUNDING GUIDELINE
MMT
MMT (IPIP)


5297 - COMMUNICATIONS/ ELECTRONICS
70
60
50
40
30
20
10
0
DOLLARS (MILLIONS)
FY83
FY84
FY85
FY86
FY87
FISCAL YEAR
KEY:
FYDP FUNDING GUIDELINE
MMT
MMT (IPIP)


5397 - OTHER SUPPORT EQUIPMENT
70
60
50
40
30
20
10
0
DOLLARS (MILLIONS)
FY83
FY84
FY85
FY86
FY87
FISCAL YEAR
KEY:
FYDP FUNDING GUIDELINE
MMT
MMT (IPIP)



ARMAMENT, MUNITIONS AND CHEMICAL COMMAND (AMCCOM)

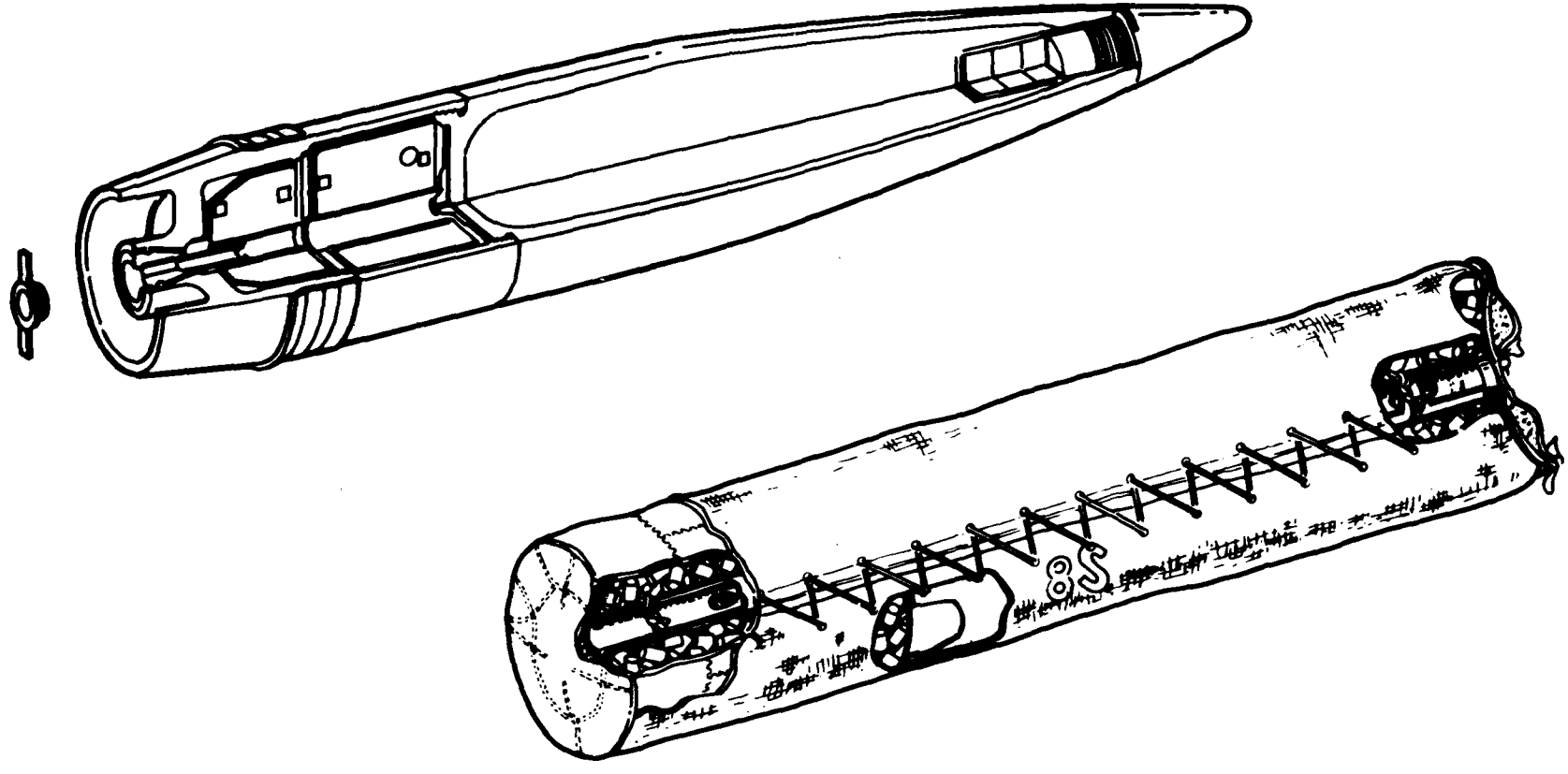
US ARMY ARMAMENT, MUNITIONS AND CHEMICAL COMMAND (AMCCOM)

AMCCOM, with headquarters at Rock Island, IL, provides and performs life-cycle management over the accomplishment of total research, development, engineering, procurement, and materiel readiness functions for conventional and nuclear weapons; ammunition (artillery, infantry, gun type air defense, surface vehicle mounted and aircraft mounted); fire control systems; chemical warfare and chemical biological defensive systems/materiel; Ammunition Peculiar Equipment (APE); Test Measurement, and Diagnostic Equipment (TMDE); and tools and maintenance equipment.

AMCCOM is also the single manager for the procurement, production, supply, maintenance and transportation of conventional ammunition for the Department of Defense.

The AMCCOM complex includes the Headquarters, two research and development centers, three project managers, four arsenals, 30 ammunition plants and activities, Defense Ammunition Center and School, and various other field and support activities. The two research and development centers (Chemical and Armament) are located at Aberdeen Proving Ground, Maryland and Dover, New Jersey respectively. The Armament Research and Development Center includes the Large Caliber Weapon Systems Laboratory, the Fire Control and Small Caliber Weapon Systems Laboratory and the Ballistic Research Laboratory. These two research and development centers are responsible for research, design, development and life cycle engineering for assigned materiel. Rock Island Arsenal in Illinois is best known for the production and assembly of gun mounts, receivers and recoil mechanisms, and for its tool set assembly mission. Watervliet Arsenal has the unique mission of producing gun and cannon tubes for the Army, Navy and Marines. Pine Bluff Arsenal is responsible for defensive chemical munitions and equipment and is the only current site at which white phosphorous-filled items are loaded. Rocky Mountain Arsenal performs demilitarization of obsolete chemical agent identification sets.

The command is staffed by approximately 22,000 military and civilian personnel. Also, 18,000 persons are employed by contractors at AMCCOM plants.



ARMAMENT, MUNITIONS AND CHEMICAL COMMAND
(AMCCOM)
(AMMUNITION)

AMMUNITION PROGRAM

Bridging the technology gap, particularly in those areas that have no civilian counterpart, is a challenging task for the Ammunition MMT Program. In many respects, the Ammunition program presents unique problems which require innovative solutions. Practically all current operations involve a great many hand operations, and methods must be found to efficiently mechanize these. Batch processes must be converted to continuous processes in order to take advantage of new materials handling techniques and to improve the safety of operations.

The primary objective of the Ammunitions Manufacturing Technology Program is to improve existing manufacturing processes, techniques, and equipment. The second objective is to bridge the gap between development and full-scale production. The third objective is to solve technological problems identified in the program.

The Manufacturing Methods and Technology effort in the Load, Assemble and Pack area is guided by four major program goals; improved economy of operation, improved safety conditions for operating personnel, establishment of a rapid response production capability, and improvements in the quality of the end product produced. All of these goals must be accomplished within the standards and criteria established for pollution abatement and energy conservation.

Recent changes in policy and guidance have required Process Technology Projects to be cost effective within the timeframe and procurement quantities of the Five Year Defense Plan (FYDP). The challenge of introducing new technology within this guidance is being met by developing systems with the flexibility to produce many items, establishing an optimum balance between system simplicity and process operational requirements, and providing equipment designs capable of high efficiency operation to achieve cost effective system operations.

Due to the inherently hazardous nature of munitions production, an extensive program has been undertaken to upgrade the safety of explosive preparation equipment, loading equipment, and assembly systems. The MMT Program relating to the upgrading of the operational safety of loading lines is a continuation of current efforts. This program will define and investigate specific operational safety hazards, and will develop equipment and systems to reduce operator exposures and risks.

AMCCOM

COMMAND FUNDING SUMMARY
(THOUSANDS)

CATEGORY	FY83	FY84	FY85	FY86	FY87
CAMOUFLAGE	0	0	400	275	0
CHEMICAL	3435	7987	8985	10776	4805
ENERGY CONSERVATION	0	270	478	4093	2339
EXPLOSIVES	520	3643	3720	6703	5156
FUZES	0	1729	978	5973	10411
GENERAL	0	0	0	650	2200
LAP	457	5739	5959	8614	16762
METAL PARTS	3072	4520	2461	6401	9299
POLLUTION ABATEMENT	963	1895	1123	0	264
PROPELLANTS	1732	1961	5866	7210	5862
QUALITY CONTROL/TESTING	0	794	2336	5050	4497
SAFETY	213	209	1577	1217	500
SMALL ARMS	1210	2279	3146	7567	2659
TOTAL	11602	31026	37029	64529	64754

CATEGORY
CAMOUFLAGE

FUNDING ($000)

	PRIOR	83	84	85	86	87

COMPONENT -- GENERAL

(0928) TITLE - PROC TECH FOR VEHICLE ENGINE EXHAUST SYSTEM — 85: 400; 86: 275

PROBLEM - AN URGENT NEED WAS ESTABLISHED BY TRADOC FOR AN M-1 TANK SMOKE SYSTEM THAT WILL BLIND DEVICES WHICH DETECT IN THE IR SPECTRUM. A VEHICLE ENGINE EXHAUST SYSTEM USED AS THE MEANS TO DISSEMINATE THE IR SCREENING AGENT PRESENTS PRODUCTION PROBLEMS.

SOLUTION - PROCESS STUDIES WILL INCLUDE, IR AGENT PREPARATION AND TREATMENT, MATERIAL HANDLING, AND LOADING TECHNOLOGY FOR THE CONTAINERS.

CATEGORY
CHEMICAL

COMPONENT -- DECONTAMINATION

(C003) TITLE - INTERIOR SURFACE DECON SYSTEM — 86: 750; 87: 700

PROBLEM - PRODUCTION PROCESS ENGR PROBLEMS MUST BE IDENTIFIED DURING R+D USING PEP FUNDS. PROCESS TECHNOLOGY REQD UNDER PRODUCTION CONDITIONS FOR COMPLEX AREAS WILL HAVE TO BE INVESTIGATED.

SOLUTION - AS A RESULT OF PEP, ESTABLISH PILOT FACILITIES AND PROVE OUT THE MASS PRODUCTION FEASIBILITY OF COMPLEX PROCESSES AND FABRICATION. PROVIDE D OF M AND PROCESS TOOLING DESIGN DATA.

(C010) TITLE - PERSONAL EQUIPMENT DECON SYSTEM — 87: 500

PROBLEM - PRODUCTION PROCESS ENGINEERING PROBLEMS MUST BE IDENTIFIED DURING R+D USING PEP FUNDS. PROCESS TECHNOLOGY REQUIRED UNDER PRODUCTION CONDITIONS FOR COMPLEX AREAS MUST BE INVESTIGATED.

SOLUTION - AS A RESULT OF PEP, ESTABLISH PILOT FACILITIES AND PROVE OUT THE MASS PRODUCTION FEASIBILITY OF COMPLEX PROCESSES AND FABRICATION. PROVIDE D OF M AND PROCESS TOOLING DESIGN DATA.

(C011) TITLE - IMPROVED CHEMICAL BIOLOGICAL DECONTAMINANT — 86: 1138

PROBLEM - PRODUCTION PROCESS ENGINEERING PROBLEMS MUST BE IDENTIFIED DURING R+D USING PEP FUNDS. PROCESS TECHNOLOGY REQUIRED UNDER PRODUCTION CONDITIONS FOR COMPLEX AREAS MUST BE INVESTIGATED.

SOLUTION - AS A RESULT OF PEP, ESTABLISH PILOT FACILITIES AND PROVE OUT THE MASS PRODUCTION FEASIBILITY OF COMPLEX PROCESSES AND FABRICATION. PKOVIDE D OF M AND PROCESS TOOLING DESIGN DATA.

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT	-- DECONTAMINATION (CONTINUED)						
(C012)	TITLE - MULTI-PURPUSE CHEMICAL-BIOLOGICAL DECONTAMINANT					500	500
	PROBLEM - PRODUCTION PROCESS ENGINEERING PROBLEMS MUST BE IDENTIFIED DURING R+D USING PEP FUNDS. PROCESS TECHNOLOGY REQUIRED UNDER PRODUCTION CONDITIONS FOR COMPLEX AREAS MUST BE INVESTIGATED.						
	SOLUTION - AS A RESULT OF PEP, ESTABLISH PILOT FACILITIES AND PROVE OUT THE MASS PRODUCTION FEASIBILITY OF COMPLEX PROCESSES AND FABRICATION. PROVIDE D OF M AND PROCESS TOOLING DESIGN DATA.						
(C013)	TITLE - INTERMEDIATE DECON KIT					400	200
	PROBLEM - PRODUCTION PROCESS ENGINEERING PROBLEMS MUST BE IDENTIFIED DURING R+D USING PEP FUNDS. PROCESS TECHNOLOGY REQUIRED UNDER PRODUCTION CONDITIONS FOR COMPLEX AREAS MUST BE INVESTIGATED.						
	SOLUTION - ESTABLISH A MASS PRODUCIBILITY PROCESS TO RESOLVE THE GLASS AMPOULE SEALING PROBLEM. PROVIDE A D OF M AND PROCESS TOOLING DESIGN DATA.						
(0913)	TITLE - SPIN COATING OF DECON AGENT CONTAINERS	255	90	164			
	PROBLEM - CURRENT METALLIC DECON AGENT CONTAINERS CORRODE BEFORE THE REQUIRED SHELF LIFE OF THE AGENTS IS REACHED. ALTERNATIVE CONTAINERS ARE NOT AVAILABLE, BUT PLASTIC LINERS HAVE BEEN SHOWN TO EXTEND THE LIFE OF CURRENT CONTAINERS SIGNIFICANTLY.						
	SOLUTION - ESTABLISH THE SPIN COATING,OR ROTATIONAL MOLDING, TECHNIQUE FOR COATING THE INSIDE OF CURRENT METALLIC CONTAINERS WITH CHEMICALLY RESISTANT POLYMERS FOR THE PRODUCTION ENVIRONMENT.						
COMPONENT	-- DETECTION/WARNING						
(C014)	TITLE - MFG TECH FOR NBC RECON VEHICLE III					500	1500
	PROBLEM - PROCESS TECHNOLOGY REQUIRED UNDER PRODUCTION CONDITIONS FOR COMPLEX AND CRITICAL COMPONENTS WILL HAVE TO BE ESTABLISHED. TWO CRITICAL COMPONENTS ARE THE MICRO-PROCESSOR AND MASS SPECTROMETER.						
	SOLUTION - MASS PRODUCTION PROCESSES AND TECHNIQUES MUST BE PROVEN OUT. DESCRIPTIONS OF MANUFACTURE WILL BE PREPARED AND IN-PROCESS TOOLING DATA ESTABLISHED.						
(0904)	TITLE - CHEMICAL REMOTE SENSING SYSTEMS	300		2155	1696		
	PROBLEM - FIRST GENERATION CHEMICAL REMOTE SENSING SYSTEMS HAVE HIGH PRIORITY. THEY REQUIRE COMPLEX, UNIQUE, SOPHISTICATED COMPONENTRY WHICH IS NOT AVAILABLE TOO MEET PRODUCTION REQUIREMENTS. COMPONENTS WILL BE HAND FABRICATED FOR INITIAL DEVELOPMENT.						
	SOLUTION - IN ORDER FOR PRODUCTION TO BEGIN AS SOON AS POSSIBLE IT IS NECESSARY THAT APPROPRIATE MANUFACTURING TECHNOLOGY START BEING DEVELOPED NOW. CONTRACTORS WITH NECESSARY EXPERIENCE WILL BE UTILIZED TO ESTABLISH PROCEDURES, ETC. FOR QUANTITY MANUFACTURING.						

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- DETECTION/WARNING (CONTINUED)							
(0920)	TITLE - XM82 AUTOMATIC LIQUID AGENT DETECTOR (ALAD)			197	773	412	
	PROBLEM - THE XM82 AUTOMATIC LIQUID AGENT DETECTOR CONTAINS A DETECTOR DISC WHICH PEP DETERMINED TO BE A CRITICAL COMPONENT REQUIRING A MASS PRODUCTION PROCESS.						
	SOLUTION - A MANUFACTURING PROCEDURE WILL BE ESTABLISHED TO PROVIDE THE MOST COST EFFECTIVE METHOD FOR MANUFACTURING THE DISC.						
(0926)	TITLE - MMT FOR XM22 CHEMICAL AGENT ALARM SYSTEM			700	1600	1900	600
	PROBLEM - A CHEMICAL AGENT ALARM SYSTEM, XM22 IS CURRENTLY UNDER DEVELOPMENT TO PROVICE CAPABILITY OF CHEMICAL DEFENSE. COMPLEX COMPONENTS IN THE ALARM ARE DIFFICULT TO PRODUCE AND LACK AVAILABLE HIGH PRODUCTION TECHNIQUES.						
	SOLUTION - ESTABLISH METHODS TO PRODUCE THE COMPLEX COMPONENTS OF THE XM22 ALARM AND INSURE MASS PRODUCTION AND DOCUMENT THE DESCRIPTION OF MANUFACTURE.						
COMPONENT -- FILTERS							
(P001)	TITLE - LEAK STANDARDS FOR DOP PENETRAMETER TESTING					210	
	PROBLEM - THE SCALE FOR PASSING A CANISTER FLASH FILTER REQUIRES ACCURATE READING OF INITIAL MASS FLOW AND THE DOWN STREAM MASS FLOW OF THE DOP AEROSOL.						
	SOLUTION - IN ORDER TO READ INSTANTANEOUS MASS FLOW, ONE MUST BE ABLE TO COUNT AND MEASURE PARTICLE SIZE WITHIN A SHORT TIME FRAME.						
(P002)	TITLE - LEAK TEST STANDARDS FOR FILTER TESTING OPERATIONS					195	
	PROBLEM - IN ORDER TO CONDUCT RELIABLE FILTER LEAK TESTING PROCEDURES, AN INDEPENDENT LEAK STANDARD IS REQUIRED TO AFFECT CALIBRATION OF THE TEST EQUIPMENT AND AID IN THE VERIFICATION OF FAILURES.						
	SOLUTION - STANDARD FILTERS WITH BUILT-IN CALIBRATED LEAKS SHOULD BE FABRICATED TO PROVIDE KNOWN LEAK RATES ABOVE AND BELOW THE FILTER BREAK POINT. THESE STANDARDS CAN THEN BE UTILIZED TO EVALUATE PROPER OPERATION OF THE TESTING SYSTEM.						
(0900)	TITLE - AUTOMATED MULTIPLE FILTER LIFE TESTER	252	343				
	PROBLEM - THERE IS A LOW TEST RATE CAPACITY AND AN INCREASING VOLUME OF TESTING FOR THE CURRENT FILTER LIFE TEST EQUIPMENT.						
	SOLUTION - REDUCE MANPOWER NEEDS BY DEVELOPING A MULTIPLE TEST CHAMBER TESTER WHICH WILL PERMIT FOUR ITEMS TO BE TESTED SIMULTANEOUSLY.						

COMPONENT -- FILTERS (CONTINUED)	PRIOR	83	84	85	86	87
			FUNDING ($000)			
(0905) TITLE - MANUFACTURE OF IMPREGNATED CHARCOAL (WHETLERITE)	256		500	260		
PROBLEM - ONLY ONE COMPANY (CALGON, INC) SUPPLIES WHETLERIZED CHARCOAL AND CONSIDERS ITS PROCESS PROPRIETARY. THIS MATERIAL IS VITAL FOR NEW PROTECTIVE MASKS. A PROCESS MUST BE DEVELOPED TO DIVERSIFY PRODUCTION BASE AND REDUCE COST THROUGH COMPETITION.						
SOLUTION - MMT PROJECT 5 76 1296 DEMONSTRATED THAT, USING DILUTE SOLUTIONS OF IMPREGNANTS AND MULTI-STAGE SOAKING AND DRYING OF CHARCOAL, SEVERAL CHARCOALS SHOWED DRAMATIC PROTECTION IMPROVEMENT. THIS PROJECT WILL USE THESE RESULTS TO ESTABLISH A PROCESS DESIGN						
(0918) TITLE - MODERNIZATION OF FILTER PENETRATION EQUIPMENT			700	848	285	
PROBLEM - CURRENTLY, ALL PROTECTIVE PARTICULATE FILTERS ARE TESTED WITH THREE TYPES OF EQUIPMENT. THIS EQUIPMENT IS OBSOLETE, INEFFICIENT, END UNRELIABLE.						
SOLUTION - DEVELOP PRETOTYPE TESTERS WITH SOLID STATE COMPONENTS UTILIZING STATE OF ART TECHNOLOGY.						
(0919) TITLE - POLLUTION ABATEMENT FOR WHETERITE CHARCOAL				846	487	
PROBLEM - THERE IS NO PROVEN PROCESS FOR THE TREATMENT AND DISPOSAL OF THE EFFLUENTS FROM THE MANUFACTURE OF WHETERIZED CHARCOAL.						
SOLUTION - PROVIDE A PROVEN PROCESS TO TREAT AND DISPOSE OF ALL THE WASTES AND EFFLUENTS OF THE MANUFACTURING PROCESS.						
(0923) TITLE - VELOCITY TRAVERSE MAPPER FOR ANNULAR CHARCOAL FILTERS				354	400	
PROBLEM - GAS FILTERS MUST BE MONITORED DURING THE MANUFACTURING PROCESS TO ASSURE THE INTEGRITY OF THE CHARCOAL BED BEFORE ASSEMBLY.						
SOLUTION - A VELOCITY TRAVERSE TECHNIQUE WILL BE ADAPTED TO MEASURE AIR VELOCITIES THROUGH ANNULAR CHARCOAL FILTERS.						
(0927) TITLE - COMPUTER AIDED PROCESS PLANNING FOR CB FILTERS				200	150	
PROBLEM - ALTHOUGH AN EXTENSIVE AMOUNT OF INFORMATION ON CHEMICAL AND BIOLOGICAL GAS FILTERS (FILTER PERFORMANCE DATA, PROCESS DESIGN INTEGRITY, PRODUCIBILITY, ETC.) EXISTS, A STRUCTURED DATA BASE IS NOT AVAILABLE.						
SOLUTION - DEVELOP A COMPUTER AIDED PROCESS PLANNING SYSTEM FOR CB FILTERS. THIS SYSTEM WILL THEN BE MADE AVAILABLE TO INDUSTRY THROUGH APPLICABLE PROCUREMENTS.						
(1295) TITLE - MOD OF CHARCOAL FILTER TEST EQUIPMENT	603	218	888	950	650	
PROBLEM - CHARCOAL FILTER TESTING EQUIPMENT NEEDED TO PROVIDE TESTING CAPABILITY FOR VARILUS CHEMICAL AGENTS DOES NOT EXIST.						
SOLUTION - DESIGN A MODULAR TESTING SYSTEM FOR VARIOUS FILTER SYSTEMS.						

		FUNDING ($000)				
	PRIOR	83	84	85	86	87
COMPONENT -- PROCESSES						
(1348) TITLE - SUPER TROPICAL BLEACH	1023	340	264			
PROBLEM - THERE IS A MAJOR SHORTFALL BETWEEN THE FY78 REQUIREMENTS FOR THIS ITEM AND THE QUANTITY OF IMPORTED CHLORINATED LIME KNOWN TO BE AVAILIABLE.						
SOLUTION - THIS PROJECT WILL PROVIDE THE BASIC DESIGN OF A SUPER TROPICAL BLEACH FACILITY. STUDIES WILL INCLUDE POLLUTION ABATEMENT AND CONTROL EQUIPMENT TO ASSURE COMPLIANCE WITH OSHA AND EPA STANDARDS.						
(4491) TITLE - TECHNOLOGY DATA BASE FOR PINACOLYL ALCOHOL				640	1874	355
PROBLEM - PINACOLYL ALCOHOL IS NOT CURRENTLY AVAILABLE COMMERCIALLY IN PRODUCTION QUANTITIES AND THEREFORE, THE ARMY HAS NO AVAILABLE SUPPLY TO SUPPORT PRODUCTION OF HIGH PRIORITY BINARY IVA CHEMICAL MUNITIONS.						
SOLUTION - THIS PROJECT WILL ESTABLISH THE OPTIMUM CHEMICAL PROCESSES AND OPERATIONAL MODES FOR PRODUCTION OF PINACOLYL ALCOHOL AND DEVELOP A TECHNICAL DATA BASE FOR SCALE-UP TO COMMERCIAL OF GOVERNMENT PRODUCTION FACILITIES						
(4547) TITLE - PROCESS TECHNOLOGY FOR IR XM76 GRENADE		319	301			
PROBLEM - NEW IR SMOKE SCREENING TECHNOLOGY NEEDED.						
SOLUTION - DEVELOP PROCESS TECHNOLOGY FOR FUTURE IPF.						
COMPONENT -- PROTECTIVE GEAR						
(P003) TITLE - LEAK STANDARDS FOR PROTECTIVE MASK					250	
PROBLEM - AN INDEPENDENT LEAK TESTING STANDARD IS REQUIRED FOR OPERATION OF PROTECTIVE MASK ACCEPTANCE TEST EQUIPMENT. THE PRESENT PROCEDURE IS SUBJECT TO CONSIDERABLE OPERATOR ERROR IN DETERMINING THE PASS OR FAIL OF A PROTECTIVE MASK.						
SOLUTION - A LEAK TEST STANDARD CONTAINING A KNOWN LEAK FACTOR WILL BE PROVIDED IN ORDER TO CALIBRATE THE EQUIPMENT WHICH WILL ALLOW THE OPERATOR LITTLE CHANCE FOR MISINTERPRETING THE FAILURE POINT.						
(0924) TITLE - MANUFACTURING PROCESS FOR GAS MASK CANISTERS		283	1254			
PROBLEM - THE CANADIAN GAS MASK CANISTER IS BEING ADAPTED TO THE US STANDARDS UNDER A MACI PROGRAM. THE CANADIANS ARE HAVING DIFFICULTY PRODUCING THE CANISTERS RESULTING IN HIGH REJECT RATE.						
SOLUTION - PROVIDE A PILOT FACILITY FOR THE EQUIPMENT, TOOLING AND TEST EQUIPMENT TO ESTABLISH AND DOCUMENT THE MANUFACTURING PROCESS FOR PRODUCING ACCEPTABLE CANISTERS.						

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- PROTECTIVE GEAR (CONTINUED)							
(0925)	TITLE - PROTECTIVE MASK LEAKAGE TESTING		199	410	468		
	PROBLEM - CURRENT GAS MASK TESTER DOES NOT SIMULATE THE ACTUAL FIELD USE AND IS NOT SENSITIVE ENLUGH TO DETECT SMALL LEAKS						
	SOLUTION - DEVELOP A MASK LEAKAGE TESTER THAT SIMULATES ACTUAL USAGE AND PROVIDES MAXIMUM SENSITIVITY TO CHALLENGE VAPORS.						
COMPONENT -- PYROTECHNICS							
(1709)	TITLE - IMPR PROCESSING OF STARTER MIX FOR PYROTECHNIC MUNITIONS	500	446				
	PROBLEM - ACCIDENTAL INVITATION OF MIXTURES DURING PROCESSING IS A SERIOUS PERSONNEL SAFETY PROBLEM DUE TO EXPOSURE TO FIRE AND EXPLOSIVE HAZARDS.						
	SOLUTION - EVALUATE NEW MIXING AND HANDLING TECHNOLOGY THAT WILL MINIMIZE EXPOSURE TO SAFE AND TOXIC MATERIALS.						
(1714)	TITLE - AUTO QUALITY CONTROL PROCEDURES F/MFG PYROTECHNIC MUNITIONS				350	325	
	PROBLEM - CURRENTLY INSPECTION PROCEDURES FOR PINE BLUFF ARSENAL?S PYROTECHNIC MUNITION FILL AND PRESS LINES ARE LABOR INTENSIVE AND MANUAL ADJUSTMENTS CAUSE RAW MATERIAL WASTE.						
	SOLUTION - DEVELOP THE USE OF PROGRAMMABLE CONTROLLERS AND SENSORS SUCH AS TRANSDUCERS, LOAD CELLS, DIGITAL BALANCES, AND DIGITAL CALIPERS TO REDUCE MATERIAL USAGE, LABOR AND IMPROVE RELIABILITY AND INCREASE PRODUCTIVITY.						
(3710)	TITLE - DEVELOP MANUFACTURING TECHNOLOGY FOR 40MM CS MUNITIONS						450
	PROBLEM - CURRENT PRODUCTION FACILITIES EXIST ONLY IN PRIVATE INDUSTRY. THIS MUNITION WILL NOW BE PRODUCED IN GOGO FACILITY FOR MOB PURPOSES. CURRENT PROCESS REQUIRES IMPROVEMENTS FOR OSHA/EPA STANDARDS.						
	SOLUTION - PROVIDE PILOT FACILITY TO PROVE OUT THE TDP. PROVIDE DESIGN CRITERIA AND PROCESS BASELINE FOR THE LAP OF CS MUNITIONS.						
(3726)	TITLE - MMT FOR LAP OF MINIATURE TORCH					350	
(4548)	TITLE - SAFETY IMPROVEMENTS OF PYROTECHNIC MIXING	491	1197	454			
	PROBLEM - PYROTECHNIC MIXING REQUIRES INCREASED PERSONNEL SAFETY FEATURES.						
	SOLUTION - EVALUATE CURRENT PROCESS AND INCREASE OPERATOR SAFETY THROUGH ADAPTION OF PROCESS CHANGES. IMPLEMENTATION THROUGH FOLLOW-ON FY86 MODERNIZATION PROJECT.						

CATEGORY	FUNDING ($000) PRIOR	83	84	85	86	87
ENERGY CONSERVATION						

COMPLMENT -- GENERAL

(2716) TITLE - USE OF HEAT FROM NITRIC ACID RECOVERY — 86: 430

PROBLEM - NITRIC ACID IS SEPARATED FROM SULFURIC ACID AND REMOVED AS A VAPOR TO THE DENITRATOR. THIS RESULTS IN A LOSS OF AVAIL ENERGY.

SOLUTION - THIS PROJECT INCLUDES THE PROCUREMENT, INSTALLATION AND EVAL OF APPROPRIATE HEAT TRANSFER EQUIP TO USE THE HEAT FROM NITRIC ACID VAPOR TO PREHEAT THE SPENT ACID FEED TO DENITRATOR, PRESENTLY ACCOMP BY THE USE OF STEAM.

(2717) TITLE - USE OF HEAT DISSIPATED IN ACID STEAM CONDENSER — 86: 395

PROBLEM - PART OF DENITRATION OPR INCLUDES TRANS OF EXCESS DENITRATION STEAM TO ACID STEAMCONDENSER WHERE CONDENSED+COOLED BEFORE FED TO NITRIC ACID ABSORPTION TOWER.CONDEN+COOL OF NITRIC ACID SOLUTION IS ACCOMP BY COOL WATER,RESULTING IN LOSS OF AVAIL ENERGY

SOLUTION - PROJ COVERS PROCURE, INSTALL + EVAL OF HEAT TRANSFER EQUIP TO USE AVAIL HEAT IN WEAK NITRIC ACID VAPOR TO PREHEAT THE MIXED ACID FEED TO DENITRATOR + REDUCE NEED F/STEAM PRESENTLY BEING USED FOR THIS PURPOSE.

(2718) TITLE - UTILIZATION OF HEAT GENERATED IN TNT MANUFACTURE — 86: 470, 87: 285

PROBLEM - NO EFFECTIVE USE IS BEING MADE OF THE HEAT REMOVED BY COOLING WATER DURING THE NITRATION STAGES IN THE MANUFACTURE OF TNT.

SOLUTION - INSTALL HEAT TRANSFER EQUIPMENT TO RECOVER THE HEAT GENERATED BY THE NITRATION REACTIONS FOR USE IN THE TNT PURIFICATION OPERATIONS.

(2720) TITLE - USE OF HEAT FROM SULFURIC ACID RECOVERY — 86: 745

PROBLEM - SPENT ACID FROM TNT PLANT IS HEATED BY STEAM + FED TO DENITRATOR WHERE NITRIC ACID IS SEP FROM SULFURIC ACID LEAVING SYS AT A TEMP OF APPROX 316F.COOLING WATER IS USED TO REDUCE TEMP OF SULFURIC ACID TO 120F,RESULTING IN LOSS OF AVAIL ENERGY.

SOLUTION - PROJ INCLUDES THE PROCURE, INSTALLATION + EVAL OF HEAT TRANSFER EQUIP TO PREHEAT SPENT ACID W/HEAT FROM THE SULFURIC ACID + MINIMIZE THE NEED FOR STEAM FOR THIS PURPOSE.

(2722) TITLE - HEAT RECOVERY FROM CYCLOHEXANONE VAPOR — 86: 405

PROBLEM - CRUDE RDX OR HMX IS DISSOLVED IN WATER/CYCLOHEXANONE SOLUTION W/AID OF STEAM HEAT. IT IS THEN RECRYSTAL TO OBTAIN DESIRED CRYSTALLINE SIZE + CONFIG BY EVAP CYCLOHEXANONE.CYCLOHEXANONE VAPOR CONDENSED BY COOLING WATER.PROCESS IS ENERGY INTENSIVE.

SOLUTION - THIS PROJ INVOLVES USE OF HEAT AVAIL FROM THE CYCLOHEXANONE VAPOR TO ACHIEVE DISSOLUTION OF THE RDX/HMX CRYSTALS + THEREBY REDUCE THE REQUIREMENT FOR STEAM.

		FUNDING ($000)				
	PRIOR	83	84	85	86	87
COMPONENT -- GENERAL (CONTINUED)						
(3714) TITLE - ALTERNATIVE AZEOTROPIC SOLVENT FOR ACETIC ACID CONCENTRATION					335	285
PROBLEM - CURRENT ACETIC ACID CONCENTRATION PROCESS AT HSAAP USES N-PROPYL ACETATE AS AN EXTRACTING AGENT TO REMOVE WATER FROM THE ACETIC ACID. THE CURRENT PROCESS USES VERY LARGE QUANTITY OF ENERGY FOR THIS PROCESS						
SOLUTION - REPLACE THE N-PROPYL ACETATE WITH N-BUTYL ACETATE OR SULFURIC ACID. N-BUTYL ACETATE AND SULFURIC ACID ARE POTENTIALLY MUCH MORE EFFICIENT AZEOTROPIC AGENTS THAN N-PROPYL ACETATE.						
(4027) TITLE - SOLVENT RECOVERY/DRYING OF SINGLE BASE PROPELLANTS	63				513	569
PROBLEM - PRESENTLY SOLVENT RECOVERY, WATER DRY, AND AIR DRY OPERATIONS ARE ACCOMPLISHED IN 3 SEPARATE TANKS, ONE TANK IS USED FOR EACH OPERATION. THESE OPERATIONS ARE BOTH LABOR AND ENERGY INTENSIVE AND GENERALLY INEFFICIENT.						
SOLUTION - COMBINE THE 3 SEPARATE OPERATIONS INTO ONE COMBINED OPERATION TO TAKE PLACE IN ONE MODIFIED SOLVENT RECOVERY TANK. THIS APPROACH WILL RESULT IN A SIGNIFICANT SAVINGS IN BOTH LABOR AND ENERGY.						
(4281) TITLE - CONSERVATION OF ENERGY AT AAPS	7778		270	478	800	1200
PROBLEM - ENERGY MAY NOT BE AVAILABLE IN THE FUTURE TO MEET PRODUCTION REQUIREMENTS.						
SOLUTION - DEVELOP ENERGY SAVING TECHNOLOGY TO APPLY TO AAP MANUFACTURING FUNCTIONS TO REDUCE QUANTITY OF ENERGY USED AT ALL LEVELS OF PRODUCTION.						

CATEGORY

EXPLOSIVES

COMPONENT -- COMP B

(4610) TITLE - GRANULATION PROCESS FOR EXPLOSIVES				647	753	
PROBLEM - EXISTING WET SLURRY PROCESS FOR GRANULAR COMPOSITION B IS LIMITED BY ITS INABILITY TO ACCURATELY REGULATE AND CONTROL PROCESS PARAMETERS.						
SOLUTION - DEVELOP A DRY DRILLING PROCESS FOR GRANULAR COMPOSITION B.						
COMPONENT -- HMX/RDX						
(4406) TITLE - IMPROVE YIELD OF HMX DURING RDX NITROLYSIS	633		1998			
PROBLEM - THE CURRENT MANUFACTURING PROCESS FOR HMX IS INEFFICIENT IN THAT YIELDS OBTAINED ARE STILL LESS THAN THEORETICAL.						
SOLUTION - THE CURRENT BACHMANN PROCESS WILL BE MODIFIED TO INCREASE THE HMX YIELD BEYOND 30 PERCENT.						

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- HMX/RDX (CONTINUED)							
(4423)	TITLE - ON-LINE MOISTURE ANALYZER FOR RDX/HMX MFG					410	
	PROBLEM - THERE IS CURRENTLY NO ON-LINE MOISTURE ANALYZER FOR RDX/HMX MANUFACTURE.						
	SOLUTION - PROVIDE AN ON-LINE ANALYZER TO CONTINUOUSLY MONITOR MOISTURE CONTENT FOR PROCESS CONTROL.						
(4449)	TITLE - PROCESS IMPROVEMENT FOR COMPOSITION C-4	402	520				
	PROBLEM - THE EXISTING FACILITIES WHICH ARE COMMON TO THE MANUFACTURE OF COMP B AND THE OTHER RDX COMPOSITION WOULD LIMIT THE AVAILABILITY OF THESE ITEMS BELOW THEIR MOB REQUIREMENTS.						
	SOLUTION - ESTABLISH NEW PROCESSES AND METHODS FOR THE MANUFACTURE OF THESE ITEMS TO MINIMIZE THE IMPACT OF COMMON OPERATIONS ON CAPACITY.						
(4525)	TITLE - PRODUCTION OF HMX FROM A MODIFIED RDX PROCESS				480	631	496
	PROBLEM - HMX IS CURRENTLY BEING PRODUCED AT A RATE OF 1/9 OF RDX. THIS HAS CONTRIBUTED TO THE HIGH PRODUCTION COST OF HMX.						
	SOLUTION - MODIFIED A CONTINUOUS RDX REACTOR AND VARY THE REACTION PARAMETERS TO PRODUCE HMX AT A MUCH EXPANDED PRODUCTION RATE (AT LEAST TWO TO FOURFOLD).						
(4574)	TITLE - IMPROVED PROCESS FOR RDX/HMX FINES MANUFACTURE			526	620	404	
	PROBLEM - CURRENTLY THE HMX PRODUCED AT HOLSTON AAP IS MECHANICALLY GROUND TO THE REQUIRED SIZE FOR USE AS ROCKET PROPELLANT. THIS PROCESS IS INEFFICIENT AND RESULTS IN HIGHER COSTS.						
	SOLUTION - UTILIZE A CHEMICAL GRINDING PROCESS FOR GRINDING OF RDX/HMX TO IMPROVE PRODUCT QUALITY, DECREASE UNIT COSTS, AND IMPROVE PROCESS EFFICIENCY.						
(4578)	TITLE - MODIFICATION + IMPROVEMENT OF DMSO PILOT PROCESS FOR RDX/HMX			588	454	1200	
	PROBLEM - PILOT SCALE PROCESS FOR RECRYSTALLIZATION OF RDX/HMX FROM DMSO WAS DESIGNED, PROCURED AND INSTALLED AT HAAP, INSUFFICIENT DATA OBTAINED TO YIELD OPTIMIZED OPERATING CONDITIONS.						
	SOLUTION - CORRECT MECHANICAL DEFICIENCIES IN EQUIPMENT AND EVALUATE AND OPTIMIZE THE PROCESS. PREPARE A TECHNICAL DATA PACKAGE FOR A FULL SCALE PROCESS BASELINE DOCUMENT.						

MMT PROGRAM PLAN
RCS DRCMT 126

		FUNDING ($000)				
	PRIOR	83	84	85	86	87
COMPONENT -- INSENSITIVE						
(1914) TITLE - PROCESS ENGINEERING FOR (EAK) EXPLOSIVE				700		
PROBLEM - THE AIR FORCE IS INVESTIGATING USE OF ETHYLENE DIAMINE DINITRATE/AMMONIUM NITRATE/POTASSIUM NITRATE EUTECTIC MIXTURE (EAK) AS A CASTABLE INSENSITIVE EXPLOSIVE FILL FOR AIR FORCE BOMBS. PROCESS ENGR PRMTRS HAVE TO BE DET TO PROVIDE DSGN INFO F/IPF.						
SOLUTION - THE AIR FORCE HAS FUNDED THE NOS TO DEVELOP A METHOD FOR MFG EAK. THIS MMT EFFORT WILL CONTINUE THE EFFORT AT NOS PERFORMING ENGR STUDIES AND DEVELOPING DESIGN PARAMETERS REQUIRED TO DESIGN THE IPF.						
COMPONENT -- PROCESS CONTROL						
(1906) TITLE - ADAPTIVE CONTROL OF EXPLOSIVES LINES					1430	2230
PROBLEM - TAKE ADVANTAGE OF THE ADVANCED PROCESS CONTROL TECHNOLOGY FOR APPLICATION TO EXPLOSIVE PROCESSES TO REDUCE MANPOWER COSTS AND PERSONNEL EXPOSURE AND INCREASE PROCESS PRODUCTIVITY.						
SOLUTION - ADAPT MINI-PROCESS CONTROLS FROM PROPELLANT PROCESSES WITH REDUCTION IN COSTS, ENHANCED REAL TIME CONTROL, REDUCED PERSONNEL EXPOSURE AND IMPROVED OVERALL EFFICIENCY.						
(1913) TITLE - PBX CONT CAST FOR BOMB LOADING				500	1250	1000
PROBLEM - ADDED USE OF CASTABLE PLASTIC BONDED EXPLOSIVES WILL CREATE PRODUCTION SHORTFALLS. MOST PBX CAN NOT BE USED IN PRESENT MELT / CAST EQUIPMENT. PBX PRODUCTION IS NOW DONE AT 2 NAVY PLANTS WHICH COULD NOT HANDLE LOADING OF CASTABLE PBX IN BOMBS.						
SOLUTION - ESTABLISH HIGH PRODUCTION RATE CONTINUOUS PROCESSES FOR MIX AND CAST OF VARIOUS PBX FORMULATIONS. IDENTIFY + EVALUATE EQUIPMENT + PROCESSES, SELECT + TEST EQUIPMENT + INTEGRATE ACCEPTABLE ITEMS INTO AN OPERATING PBX PROCESSING PILOT PLANT.						
(4566) TITLE - RDX/HMX RECRYSTALLIZATION PARTICLE SIZE CONTROL			531			
PROBLEM - CURRENT LABORATORY MECHANICAL SCREENING TECHNIQUE FOR DETERMINING PARTICLE SIZE DISTRIBUTION OF RDX/HMX IS TIME CONSUMING.						
SOLUTION - AN ON-LINE PARTICLE SIZE MEASUREMENT SYSTEM WILL BE ADAPTED AND INSTALLED IN THE RECRYSTALLATION OPERATION.						
(4613) TITLE - METHOD F/PROCESS ANALYSIS OF RDX/HMX SLURRY				319	375	
PROBLEM - THERE IS CURRENTLY NO DIRECT METHOD FOR MEASURING RDX/HMX PROCESS STREAMS. CURRENT WET CHEMICAL METHODS ARE TIME CONSUMING AND LABOR INTENSIVE.						
SOLUTION - DEVELOP AN AUTOMATIC ANALYZER SYSTEM FOR THE RDX/HMX STREAMS BASED ON CURRENTLY AVAILABLE ANALYTICAL EQUIPMENT.						

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- PROPELLANTS/EXPLOSIVES							
(3036)	TITLE - INSENSITIVE HIGH EXPLOSIVES FOR LARGE CALIBER SHELLS (NEAK)						455
	PROBLEM - PROVIDE HIGH PERFORMANCE INSENSITIVE PROJECTILE UNTIL AN ALTERNATE TO RDX AND TNT.						
	SOLUTION - DEVELOP NITROGUANIDINE-ETHYLENE DIAMINETEDINIBATE-AMMONIUM NITRATE COMPOSION STABILIZED WITH POTASSIUM NITRATE (NEAK) FOR LARGE CALIBER PROJECTILES. INVESTIGATE APPLICATION TO LOW VULNERABILITY EXPLOSIVES (LOVA) AND HARD TARGET PENETRATORS.						
COMPONENT -- TNT							
(P124)	TITLE - ELECTROCHEMICAL REDUCTION OF DNT AND TNT ISOMERS						275
	PROBLEM - ON-LINE ANALYSES OF CONTINUOUS TNT NITRATION STREAMS FOR DNT AND TNT ISOMERS ARE NEEDED TO REPLACE TIME-CONSUMING SAMPLE ANALYSIS FOR PROCESS CONTROL.						
	SOLUTION - ELECTROCHEMICAL REDUCTION OF DNT AND TNT ISOMERS WILL BE STUDIED AND EVALUATED AS AN ON-LINE METHOD OF ANALYSIS FOR THE CONTINUOUS TNT NITRATION.						
(3729)	TITLE - MFG PROCESSES F/SPEC CONCRETE STRUCTURE DEMOLITION CHARGES					250	200
(3734)	TITLE - MFG PROCESSES F/SPEED, SAFE PREEMPLOYED EXPLOSIVE DEVICE						500
********** CATEGORY ********** FUZES **********							
COMPONENT -- ELECTRONICS							
(L222)	TITLE - BORESIGHTING OF SFF WHD W/IR SENSOR					200	115
	PROBLEM - NO PRODUCTION PROCESS EXISTS TO BORE SIGHT STORM WARHEAD TO IR SENSOR. PRESENT HAND PROCESS REQUIRES SEVERAL HOURS AND IS UNRELIABLE.						
	SOLUTION - DEVELOP EQUIPMENT TO AUTOMATE PROCESS.						

		FUNDING ($000)				
	PRIOR	83	84	85	86	87
COMPONENT -- ELECTRONICS (CONTINUED)						
(2734) TITLE - TEST AND PROCESS FOR GUN RUGGED CRYSTAL OSCILLATORS					1000	1500
PROBLEM - THERE IS A NEED FOR PRODUCTION TEST EQUIPMENT AND PROCESSES THAT CAN TEST AND SCREEN QUARTZ CRYSTALS TO INSURE SURVIVABILITY IN THE BALLISTIC ENVIRONMENT.						
SOLUTION - THE GOAL OF THIS PROJECT IS TO DEVELOP APPROACHES AND DESIGN EQUIPMENT WHICH CAN PROVIDE PRODUCTION SCREENING OF QUARTZ CRYSTALS TO INSURE SURVIVABILITY IN THE BALLISTIC ENVIRONMENT.						
(3716) TITLE - SENSOR TECHNOLOGY					1000	1500
PROBLEM - REPLACE CONVENTIONAL (AND COMPLEX) FUZES WITH OPTICAL SENSING DEVICES.						
SOLUTION - THIS TECHNOLOGY (SENSOR) WILL BE HIGHLY AUTOMATED IN PRODUCTION AND HIGHLY ACCURATE IN USE (COMMERCIAL APPLICATIONS WILL BE NUMEROUS IN THIS TIME SPAN).						
(3731) TITLE - MFG PROCESSES F/XM742 AND XM762 ELECTRICAL TIMER					1000	1000
(3742) TITLE - MFG PROCESSES F/MILLIMETER WAVE TECH FUZES/SEEKER SYSTEMS					1500	1500
(3743) TITLE - MFG PROCESSES F/ADV MICROCOMPUTER APPLIC IN FUZING/SEEKERS						1000
(4570) TITLE - IMPR MFS PRO TES PROC F/XM762 ARTY ELECT TIME FUZE			387	978	753	
PROBLEM - CRYSTAL DEFECTS CAN CAUSE CRYSTAL OSCILLATORS TO FAIL AT HIGH SETBACK FORCES. ALSO, VARIATIONS IN MAGNETIC PROPERTIES OF PARTS IN THE SETBACK GENERATOR CAN CAUSE LOW OUTPUT, AND EACH FUZE MODULE SHOULD BE TESTED AS IT IS BEING ASSEMBLED.						
SOLUTION - SCREEN COMMERCIAL CRYSTALS AFTER MAKING THEM USING IMPROVED MANUFACTURING PROCESSES. ALSO, ASSEMBLE, MAGNETIZE AND TEST THE SETBACK GENERATOR. AND TEST EACH FUZE MODULE (ENCODER, SETBACK GENERATOR, S*A, AND ELECTRONIC ASSEMBLY) PRIOR TO ASSEMBLY.						
COMPONENT -- METAL PARTS						
(2736) TITLE - CHEMICAL MACHINING OF PRECISION COMPONENTS					120	250
PROBLEM - HOLDING TOLERANCES AND HIGH SCRAP RATES ARE COMMON PROBLEMS WHEN SMALL THIN FUZE PARTS ARE STAMPED IN A PRESS. STAMPING IS CAPITAL INTENSIVE AND IS ONLY GOOD FOR VERY HIGH VOLUME QUANTITIES.						
SOLUTION - CHEMICAL MACHINING OF COMPONENTS REQUIRES LESS CAPITAL EQUIPMENT AND PRODUCES A MUCH SMALLER QUANTITY OF SCRAP.						
(3732) TITLE - MFG PROCESSES F/MULTI-OPTION FUZES						1500

		FUNDING ($000)				
	PRIOR	83	84	85	86	87
COMPONENT -- METAL PARTS (CONTINUED)						
(3744) TITLE - IMPROVED OPTICS MFG PROCESS F/ADVANCED SEEKER SYSTEMS						1000
(4401) TITLE - HOT FORMING + COLD HEADING LARGE FUZE COMPONENTS						321
PROBLEM - MULTISPINDLE BAR MACHINES DATE FROM 1950. THEY HAVE LOW PRODUCTIVITY, DO NOT MEET OSHA, CANNOT USE CARBIDE TOOLS, AND ARE WITHOUT SPARE PARTS.						
SOLUTION - APPLY MOD TECH SUCH AS HOT FORGE AND COLD HEADING TO OBTAIN SHAPE + REDUCE MACHINING AND SCRAP. THIS ALLOWS HIGH SPEED CHUCKERS FOR FINISH MACHINING.						
COMPONENT -- POWER SUPPLIES						
(1803) TITLE - IMPROVED LEAD DIOXIDE ELECTROPLATING TECHNOLOGY			346			
PROBLEM - ADHESION OF PB/2 PLATE IN ELECTRODES IN LIQUID RESERVE POWER SUPPLIES FOR SPIN-STABILIZED FUZING IS OFTEN POOR. THIS CAUSES (1)CHIPPING AND FLAKING, HENCE REJECT MATERIAL AND (2)POOR DISCHARGE EFFICIENCY AT HIGH TEMPS CAUSING SHARER BATTERY LIFE						
SOLUTION - R+D ESTABLISHED THAT ANODIZATION OF NICKEL SURFACE AND CAREFUL CONTROL OF PROCESS PARAMETERS ARE CRITICAL TO NI-PB/2 BOND. IT IS PROPOSED TO UPGRADE PROD FACILITY FOR NI ANODIZATION AND THEN OPTIMIZE PARAMETERS CRITICAL TO PLATE ADHESION.						
COMPONENT -- QA/TESTING						
(2739) TITLE - TEST EQPT AND PROCESSES FOR XM762 ELECTRONIC FUZE					400	725
PROBLEM - THERE IS A NEED FOR THE EQUIPMENT AND PROCESSES THAT CAN PROVIDE PRODUCTION TESTING OF FUZE ASSEMBLIES AT THE MOBILIZATION PRODUCTION RATE.						
SOLUTION - THE GOAL OF THIS PROJECT IS TO DEVELOP TESTING APPROACHES AND DESIGN EQUIPMENT WHICH CAN PROVIDE PRODUCTION TESTING OF FUZE COMPONENTS AND ASSEMBLIES AT THE MOBILIZATION PRODUCTION RATE.						
COMPONENT -- THICK FILM						
(1802) TITLE - AUTOMATED OPTICAL MICROELECTRONICS INSPECTION			996			
PROBLEM - HYBRID FABRICATION INVOLVES CHIP PLACEMENT + CHIP + WIRE BONDING. INSPECTION IS NOT UNIFORM AMONG INSPECTORS + IS TIME CONSUMING. NEW AUTOMATIC INSPECTION PROCESS ARE NEEDED WHICH INSURE DEVICE UNIFORMITY + GUARANTEE RELIABILITY.						
SOLUTION - A SCANNING SYSTEM WILL BE DEFINED BY DIGITIZING AN OPTICAL IMAGE FROM LOCALIZED INSPECTION AREAS. A COMPUTER SYSTEM WILL BE AUTHORIZED TO COORDINATE DIGITIZING + SCANNING TASKS.						

CATEGORY

GENERAL

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- MISCELLANEOUS							
(2742)	TITLE - LASER APPLIED DURABLE COATINGS					150	200
	PROBLEM - PRODUCTIVITY IS A FUNCTION OF RAM TO INCREASE RELIABILITY AND REDUCE MAINTENANCE DOWNTIME AND COST IN THE MUNITIONS PLANT ENVIRONMENT IS VERY DIFFICULT.						
	SOLUTION - UTILIZE LASER APPLIED DURABLE COATINGS ON MACHINE AND TOOL WEAR SURFACES AND IN CORROSIVE ENVIRONMENTS.						
(3727)	TITLE - MFG PROCESSES FOR VARIABLE TIME FIRING DEVICES						250
(3730)	TITLE - MFG PROCESSES F/SENSOR OFF-ROUTE MINE SYSTEM (STURMS)					500	750
(3748)	TITLE - ADVANCED MFG PROCESSES F/IMPROVED SENSORY MUNITIONS (ISM)						1000

CATEGORY

LAP

COMPONENT -- ASSEMBLY							
(4062)	TITLE - AUTO MFG SUPPORT FOR MORTAR INCREMENT CONTAINERS	7184	250				
	PROBLEM - THE MANUFACTURE AND ASSEMBLY OF THE 60/81MM PROP CHARGE INCREMENT CONTAINER IS LABOR INTENSIVE AND DOES NOT MEET PRODUCTION REQUIREMENTS.						
	SOLUTION - DEVELOP PROCESS AND EQUIPMENT TO REDUCE COSTS, INCREASE PRODUCTION RATES, AND IMPROVE QUALITY.						
(4198)	TITLE - AUTOMATED LAP OF STICK PROPELLANT CHARGES			1007			
	PROBLEM - STICK PROPELLANT CHARGES HAVE NO LAP PROCESSING PRECEDENT. CURRENT MANUAL METHODS OF PRODUCTION ARE INEFFECTIVE IN ACHIEVING SATISFACTORY LEVELS OF QUALITY, COST, SAFETY AND PRODUCTION READINESS.						
	SOLUTION - EFFICIENT HIGH SPEED AUTO LAP EQUIPMENT WILL BRING PRODUCTION OF STICK PROPELLANT CHARGES TO A LEVEL CONSISTENT WITH MODERN TECHNOLOGY. AN INITIAL ENGINEERING STUDY TO DEFINE CONCEPTS AND PARAMETERS TO BE FOLLOWED BY PROTOTYPE EQUIPMENT IS PROPOSED.						

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- ASSEMBLY	(CONTINUED)						
(4368)	TITLE - DEVELOP AUTOMATED EQPT FOR SEALING M55 DETONATORS				795		
	PROBLEM - CURR M55 DETS ARE BEING LACQUERED. 2 APPROACHES TO SEALING ARE BEING INVEST. 1 USED FOIL PRECOATED W/ADHESIVE + THE OTHER WELDS THE DET CUP TO FOIL. BOTH CAN BE PERF ON A LOADER.LESS HANDLING WILL REDUCE COST OF DET.						
	SOLUTION - DEVELOP EQUIPMENT BASED ON EITHER THE HOT MELT ADHESIVE OR ULTRA SONIC WELDING TECHNIQUE CURRENTLY BEING INVESTIGATED. RETROFIT BOTH SINGLE-TOOL AND MULTI-TOOL DETONATOR LOADERS WITH EQUIPMENT TO SEAL THE M55 DETONATOR.						
(4523)	TITLE - RAPID MOISTURE ANALYSIS OF EXPLOSIVE MIXES			200			
	PROBLEM - PRESENT MOISTURE ANALYSIS TECHNIQUE REQUIRES SOME 3 3/4 HOURS PER SAMPLE. IN AN AUTOMATED BACKLINE, THIS IS TOO LONG A PERIOD TO WAIT RELATIVE TO AN ACCEPTANCE/REJECTION DECISION FOR THE BATCH.						
	SOLUTION - INVESTIGATE THREE KNOWN TECHNIQUES FOR RAPID MOISTURE ANALYSIS AND PROCEED WITH THE OPTIMUM TO THE PROTOTYPE STAGE.						
(4595)	TITLE - AUTOMATED ASSEMBLY OF M21 FLASH SIMULATOR				550	870	
	PROBLEM - THE LONGHORN AAP PRODUCTION LINE IS BASICALLY A HAND LINE OPERATION WHICH IS LABOR INTENSIVE AND EXPOSES THE LINE OPERATORS TO POTENTIALLY HAZARDOUS OPERATIONS.						
	SOLUTION - DEVELOP SEMI-AUTOMATED OR MECHANIZED ASSEMBLY EQUIPMENT WHICH WOULD SIGNIFICANTLY REDUCE THE PRODUCTION MANPOWER REQUIREMENTS AND REDUCE THE EXPOSURE OF PERSONNEL TO POTENTIALLY HAZARDOUS OPERATIONS.						
(4606)	TITLE - AUTOMATED ASSEMBLY OF BLU 97/B COMBINED EFFECTS MUNITION			1418			
	PROBLEM - MANUFACTURE OF THE BLU-97/B ON THE HAND LINE AT KANSAS AAP IS LABOR INTENSIVE AND EXPOSES PERSONNEL TO POTENTIALLY HAZARDOUS OPERATIONS. THE HAND LINE PRODUCTION SYSTEM WILL RESULT IN HIGH UNIT COSTS AND REQUIRE A LARGE PHYSICAL ASSEMBLY FACILITY.						
	SOLUTION - DEVELOP AUTOMATED SYSTEM FOR ASSEMBLY OF THE BLU-97/B WHICH WOULD REDUCE PRODUCTION AREA SIZE REQUIREMENT, PRODUCTION MANPOWER REQUIREMENTS AND PERSONNEL EXPOSURE TO HAZARDOUS OPERATIONS.						

		FUNDING ($000)				
	PRIOR	83	84	85	86	87
COMPONENT -- GENERAL						
(0003) TITLE - APPLICATION OF NEW INDUSTRIAL PROCESSES TO LAP TECHNOLOGY					600	2700
PROBLEM - THERE ARE NUMEROUS REQUIREMENTS IN THE LAP AREA THAT COULD TAKE ADVANTAGE OF THE LATEST TECHNOLOGY DEVELOPMENT IN INDUSTRY. WE MUST PROVIDE FOR THE APPLICATION OF THIS TECHNOLOGY TO OUR LINES THROUGH ENGINEERING PROJECTS.						
SOLUTION - THIS TECHNOLOGY THRUST COVERS THE APPLICATION OF NEW TECHNOLOGY DEVELOPMENTS IN INDUSTRY TO LAP PROCESSES. THESE MAY INVOLVE WEIGHING, MATERIAL HANDLING, MATERIAL DEVELOPMENT, AND EQUIPMENT APPLICATION.						
(P015) TITLE - DEVELOP TECHNOLOGY FOR MFG OF DELAY TRAINS					250	400
PROBLEM - DELAY TRAIN PRODUCTION CONTRACTED OUT. DISRUPTION OF PRODUCTION. D EFECTIVE COMPONENTS.						
SOLUTION - PROVIDE DELAY TRAIN MFG IN-HOUSE. PROVIDE INLINE CONCEPT FOR ITEMS. PROVIDE INTEGRATED FACILITY.						
(2703) TITLE - THREAD CLEANING/INSPECTION OF HE LOADED MUNITIONS					240	150
PROBLEM - THE THREADS OF HE LOADED MUNITIONS ARE CLEANED INDIVIDUALLY BY HAND. THE OPERATION IS LABOR INTENSIVE AND HAZARDOUS TO THE OPERATOR.						
SOLUTION - UTILIZING CURRENT TECHNOLOGY DESIGN + BUILD PROTOTYPE EQUIP THAT WILL CLEAN, INSPECT + TRANSFER THE MUNITION THROUGH ENTIRE OPERATION CYCLE AUTOMATICALLY.						
(4251) TITLE - AUTO MANU OF DELAY FOR M549 AND XM650 PROJECTILES						968
PROBLEM - CURRENT OPERATION ARE LABOR INTENSIVE. COST OF ITEM IS HIGH.						
SOLUTION - DEV AUTO LAP EQUIP.						
(4522) TITLE - AUTO CARRIER CLEANING STATION FOR DET FAC				621		
PROBLEM - CARRIERS USED IN PRODUCTION MAY HAVE CONSIDERABLE POWDER ON THEM WHICH MUST BE REMOVED IN A SAFE MANNER. THE CURRENT MANUAL OPERATION IS POTENTIALLY HAZARDOUS.						
SOLUTION - DEVELOP AN AUTOMATED POWDER REMOVAL AND CLEANING STATION FOR THE AUTOMATED CONVEYOR SYSTEM AT THE LSAAP MODERNIZED DETONATOR FACILITY.						
(4550) TITLE - AUTO ASSY OF M22 FLASH SIMULATOR			465	840		
PROBLEM - ITEM MANUFACTURED AT LONGHORN AAP ON HAND LINE WHICH IS A LABOR INTENSIVE OPERATION. ITEM ALSO MANUFACTURED BY PRIVATE INDUSTRY.						
SOLUTION - THE MMT WILL DEVELOP AUTOMATED EQUIPMENT AND REDUCE LABOR FOR MANUFACTURE. PROJECT WILL BE SELF-IMPLEMENTING AT LONGHORN AAP.						

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- LOAD							
(D001)	TITLE - 60MM SMOKE PDN TECH F/IMPROVED SMOKE MUNITION					460	450
	PROBLEM - A FAMILY OF NEW IMPROVED RP OR WP SMOKE ROUNDS INCLUDING 60MM MORTAR IS BEING DEVELOPED. FUTURE PRODUCTION IS DEPENDENT ON THE AVAILABILITY OF NEW TECHNOLOGY AND PRODUCTION EQUIPMENT.						
	SOLUTION - DEVELOP TECHNOLOGY REQUIRED TO DESIGN PILOT EQUIPMENT FOR FILLING IMPROVED SMOKE 60MM MUNITION INCORPORATION RP WICK MATERIAL WITH WP.						
(L308)	TITLE - PRESS/INJECTION LOADING OF INSENSITIVE HE					200	
	PROBLEM - NO PROBLEM PROVIDED.						
	SOLUTION - NO SOLUTION PROVIDED.						
(1701)	TITLE - BULK TRANSFER OF CHEMICAL MATERIALS	221	207				
	PROBLEM - CURRENT TECHNIQUE FOR RETRIEVAL WEIGHING AND TRANSPORTING PYROTECHNIC CHEMICAL CONSTITUENTS ARE ACCOMPLISHED BY LABOR INTENSIVE OPERATION AND ARE UNSAFE.						
	SOLUTION - AN EFFICIENT MATERIALS HANDLING SYSTEM WILL BE SURVEYED AND DEVELOPED SO THAT EPA/OSHA STANDARDS WILL BE MET.						
(1712)	TITLE - FILL AND PRESS TECHNOLOGY F/M8 RP GRENADE				340		
	PROBLEM - THERE IS CURRENTLY NO AVAILABLE FILL AND PRESS FACILITY FOR LOADING RED PHOSPHOROUS GRENADES. CURRENT POWDER HANDLING AND COMPACTION TECHNOLOGY IS NOT ACCEPTABLE.						
	SOLUTION - DEVELOP THE MANUFACTURING TECHNOLOGY TO FILL, PRESS, COMPACT THE M8 RED PHOSPHOROUS GRENADE.						

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- LOAD	(CONTINUED)						
(2707)	TITLE - IMPROVED PROCESS FOR HE CAVITY FORMING					650	
	PROBLEM - CURRENT GOCO PROCESSES REQUIRE MACHINING OF EXPLOSIVE CAVITIES . THIS IS VERY HAZARDOUS AND MUST BE PERFORMED BEHIND A BARRICADE AND IS VERY COSTLY.						
	SOLUTION - REDESIGN HE POURING FUNNEL TO ELIM MACHINING. THIS WILL DRASTICALLY REDUCE COST AS NO BARRICADE IS REQUIRED, EXPENSIVE MACHINERY/MAINT IS ELIMINATED AND SUPPORTING LABOR IS REDUCED.						
(3706)	TITLE - MFG/LOG TECH F/NORWEGIAN BASED PROJECTILES					700	500
	PROBLEM - DEVELOP AND DEMONSTRATE A PROTOTYPE LAP LINE FOR RAUFOSS-TYPE PROJECTILE CAPABLE OF APPROXIMATING US HIGH VOLUME TECHNIQUES WITHOUT DEGRADING PERFORMANCE.						
	SOLUTION - DEVELOP A HIGH VOLUME LAP LINE FOR THE RAUFOSS-TYPE ROUND STARTING WITH DEVELOPMENT OF HANDLING INSPECTION AND PRESS LOADING FOR DIFFERENT HIGH EXPLOSIVES AND INCENDIARY MIXES AND PROGRESSING TO HIGH VOLUME DEMONSTRATION.						
(3721)	TITLE - MFG PROCESS F/LAP OF IMPROVED MINE SYSTEM					500	750
(3722)	TITLE - MFG PROCESSES F/LAP OF OFF-ROUTE ANTITANK MINE SYSTEM					700	1500
(3723)	TITLE - MFG PROCESS F/LAP OF THE GUIDED ANTIARMOR MORTAR PROJECTILE					1000	1500
(3724)	TITLE - MFG PROCESSES F/LAP OF THE UNIVERSAL MINE DISPENSING SYSTEM						750
(3725)	TITLE - MFG PROCESSES F/LAP OF ADVANCED CONCEPT MINE SYSTEMS						1500
(3728)	TITLE - MFG PROCESSES F/WIDE AREA SPRAY SYSTEM (SPRAY FAE)					350	750
(3733)	TITLE - MFG PROCESSES F/ADV DET DESIGNS					250	850
(3735)	TITLE - MFG PROCESS F/WALL BREAKING CHARGE					250	250
(3746)	TITLE - TECHNOLOGY F/LAP OF DIRECT SUPPORT WEAPON SYS (DSWS) AMMO						1000

COMPONENT -- LOAD (CONTINUED)

		FUNDING ($000)				
	PRIOR	83	84	85	86	87
(4078) TITLE - UPGRADE SAFETY READINESS AND PRODUCTIVITY OF EXIST MELT POUR	300		621	928		
PROBLEM - SIGNIFICANT IMPROVEMENT OF MELT POUR FACILITIES IS NOT BEING REALIZED BECAUSE DESIGN APPROACHES FOR COST-EFFECTIVE INTERMEDIATE UPGRADING ARE NOT AVAILABLE.						
SOLUTION - DEVELOP A SERIES OF PROCESS DESIGN CONCEPTS TO IMPROVE SAFETY, REDUCE EXPLOSIVE QUANTITIES, REMOVE PERSONNEL FROM HAZARDOUS AREAS, INCREASE EFFICIENCY AND REDUCE PRODUCTION COSTS. PROVIDE MODULAR DESIGN PKGS F/VARIOUS PROCESSES AND UPGRADING LEVELS.						
(4086) TITLE - REPROCESSING EXPLOSIVE FINES AND DRILL SCRAP				850		
PROBLEM - FINELY DIVIDED EXPLOSIVE SCRAP GENERATED IN CAVITY DRILLING AND RISER CRUSHING OPERATIONS IS CURRENTLY BURNED AS WASTE. IT CANNOT BE REPROCESSED IN ITS GENERATED STATE DUE TO HANDLING PROBLEMS AND AGGLOMERATION WHEN INTRODUCED INTO MELT SYSTEMS.						
SOLUTION - DEVELOP A SYSTEM TO SCREEN, INSPECT AND REPROCESS THE FINE EXPLOSIVE INTO FLAKE EXPLOSIVE THAT CAN BE EASILY TRANSPORTED AND DIRECTLY INTRODUCED INTO MELT POUR SYSTEMS.						
(4373) TITLE - SILK SCREEN DEPOSITION OF PRIMARY EXPLOSIVES					730	1244
PROBLEM - CURRENT NON-ELECTRIC DETONATOR FACILITIES, EQUIPMENT AND METHODS LACK VERSATILITY, PRESENT PROBLEMS IN QUALITY AND UNIFORMITY OF PRODUCT AND ARE COSTLY IN OPERATION AND MAINTENANCE.						
SOLUTION - EVAL NEW IMPROVED OR MODIFIED EQUIPMENT AND TECHNIQUES FOR THE MASS PRODUCTION OF DETONATORS USING SILK-SCREEN TECHNIQUES WITH THE ULTIMATE GOAL OF MODERNIZING PRODUCTION FACILITIES.						
(4510) TITLE - AUTO ASSY OF ADDITIVE LINER TO TANK CTG			484			
PROBLEM - APPLYING ADHESIVE TO, CURLING, AND INSERTING AND POSITIONING THE LINER INSIDE THE CASE IS LABOR INTENSIVE AND SUBJECT TO POOR QUALITY AND EXCESSIVE SCRAP GENERATION.						
SOLUTION - DESIGN, BUILD AND TEST A SEPARATE PROTOTYPE PRODUCTION MACHINE FOR INSERTION OF ADDITIVE LINERS INTO THE 105MM CARTRIDGE CASE.						
(4520) TITLE - PRESS LOADING OF HMX COMPOSITIONS FOR TANK ROUNDS			589	468		
PROBLEM - THE 105MM XM815 WILL BE THE FIRST TANK ROUND TO USE A PRESSED SHAPED CHARGE. A PRODUCTION PROCESS FOR PRESS LOADING MUST BE ESTABLISHED EVALUATING SEVERAL CANDIDATE EXPLOSIVES AND ESTABLISHING TOOLING DESIGN AND PRESSING PARAMETERS.						
SOLUTION - PROCESSING PROCEDURES WILL BE ESTABLISHED FOR HMX COMPOSITIONS AND A LIMITED NUMBER OF UNITS LOADED, EVALUATED, AND TESTED. PROCESS EQUIPMENT WILL BE IDENTIFIED SO THAT PROPER PRESS LOADING PROCEDURES MAY BE IMPLEMENTED INTO PRODUCTION.						

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- LOAD (CONTINUED)							
(4524)	TITLE - LOW VOLUME AUTO MELT-POUR EQUIP FOR LOADING SMALL AP MINES			385	332		
	PROBLEM - CURRENT EXPLOSIVE LOADING OF SMALL AP MINES IS ACHIEVED BY HIGHLY LABOR INTENSIVE OPERATIONS. LARGE VOLUME TECHNIQUES ARE NOT APPLICABLE BECUASE OF LOW PLANNED PRODUCTION QUANTITIES.						
	SOLUTION - DEVELOP A LOW COST, LOW VOLUME AUTOMATED INJECTION MOLDING SYSTEM FOR MELT LOADING OF FASCAM MINES.						
(4561)	TITLE - FILL/CLOSE + LAP TECHNOLOGY FOR BINARY IVA MUNITIONS					314	
	PROBLEM - NEW IVA BINARY MUNITIONS WILL REQUIRE PROCESS BASELINE FOR DESIGN OF PRODUCTION FACILITIES TO FILL/CLOSE AND LAP THE ITEMS.						
	SOLUTION - MANUFACTURING PROCESSES WILL BE ESTABLISHED AND PROTOTYPE EQUIPMENT ACQUIRED TO PRODUCE THE IVA MUNITIONS.						
COMPONENT -- SUPPORT							
(0002)	TITLE - IMPROVED AUTOMATED LAP MATERIAL HANDLING TECH					550	1500
	PROBLEM - MATERIAL HANDLING EQUIPMENT USED IN LINES AT LAP PLANTS IS GENERALLY OLD AND COSTLY TO OPERATE, MAINTAIN, AND SUPPORT.						
	SOLUTION - THIS PROJECT WILL EXPLORE STATE OF THE ART EQUIPMENT WITH EMPHASIS ON ADAPTATIONS REQUIRED FOR OPERATION IN AN EXPLOSIVE ENVIRONMENT.						
COMPONENT -- TNT							
(4200)	TITLE - TNT CRYSTALLIZER FOR LARGE CALIBER	420		570	235		
	PROBLEM - TNT MELT LOADING REQUIRES AN OPTIMUM RATIO OF MOLTEN AND SOLID TNT IN THE EXPLOSIVE MIX AT THE TIME OF POUR. THE RATIO IS OBTAINED BY THE ADDITION OF FLAKE TNT TO A QUANTITY OF MOLTEN TNT BASED ON OPERATOR JUDGEMENT.						
	SOLUTION - DEV A DEVICE WHICH UTILIZES MOLTEN TNT TO GEN A SLURRY CONSISTENCY THROUGH PARTIAL CONTROLLED, STEADY-STATE CRYSTALLIZATION. BY CLOSE CONTROL OF TNT FLOW RATE AND THERMAL PARAMETERS, A CONTINUOUS FINE GRAINED SLURRY MIX OF PROPER RATIO WOULD RESULT.						

CATEGORY
METAL PARTS

		FUNDING ($000)				
	PRIOR	83	84	85	86	87
COMPONENT -- CARTRIDGE CASES						
(4542) TITLE - ULTRASONIC DEEP DRAWING OF CANNON STEEL CARTRIDGE CASES					338	232
PROBLEM - DEEP DRAWN STEEL CASES REQUIRE MULTIPLE DRAWS AND REQUIRE EXCESSIVE PROCESSING AND ENERGY VS BRASS.						
SOLUTION - ULTRASONIC ACTIVATION OF FORMING DIES HAS POTENTIAL FOR REDUCING DRAWING FORCES AND ELIMINATING STEPS IN THE DRAWING PROCESS.						
COMPONENT -- FORMING/MACHINING						
(2726) TITLE - LASER CUTTING SLOTS IN HARDENED STEEL STRUCTURES					250	190
PROBLEM - CURRENT TECHNOLOGY EMPLOYED TO FORM SLOTS IN HARDENED STEEL STRUCTURE OF VARYING THICKNESS IS SLOW AND COSTLY. A MORE COST EFFECTIVE TECHNIQUE IS REQUIRED.						
SOLUTION - ADAPT STATE-OF-THE-ART MICROPROCESSOR CONTROLLED LASER CUTTING EQUIPMENT TO PRODUCE CLOSE TOLERANCED ORDNANCE CONFIGURATIONS IN HARDENED STRUCTURES.						
(2731) TITLE - ULTRASONIC ASSISTED MACHINING					350	
PROBLEM - DIFFICULT TO MACHINE MATERIALS REQUIRE REDUCED FEEDS AND SPEEDS AND INCREASED TOOL WEAR AND BREAKAGE ALL OF WHICH CONTRIBUTES TO INCREASED MACHINING COSTS.						
SOLUTION - STUDIES SHOW THAT ULTRASONIC ACTIVATION OF CUTTING TOOLS RESULTED IN REDUCED LOADS AND WEAR WHEN CUTTING DIFFICULT TO MACHINE MATERIALS. ECONOMIC BENEFITS WILL BE ESTABLISHED BY APPLYING THE LAB METHODS TO REAL WORLD MACHINING SITUATIONS.						
(3703) TITLE - WASP SHAPED CHARGE LINER					400	500
PROBLEM - THE WARHEAD (WASP) SHAPED CHARGE LINER IS PROJECTED TO HAVE A DOUBLE CONTOUR WITH VARIABLE THICKNESS WALLS. MACHINING COSTS FOR THIS LINER COULD BE AS MUCH AS $250 IN 'THEN-YEAR' DOLLARS.						
SOLUTION - NO SOLUTION PROVIDED.						
(3712) TITLE - PRODUCTION BASE FOR NOVEL SHAPED CHARGE LINERS					250	500
PROBLEM - NEW SHAPED CHARGE MATERIALS BEING INVESTIGATED TO COMBINE HIGH MASS AND PYROPHORICITY WILL HAVE NO PRODUCTION BASE BECAUSE OF THE NATURE OF THE MATERIALS.						
SOLUTION - A COMBINATION OF RHEOCASTING THE COMPOSITE AND PRESSURE CASTING TO REMOVE EXCESS LOW DENSITY MATERIAL CAN PRODUCE SHAPED STOCK FOR FURTHER WARM WORKING.						
(3713) TITLE - EQUIP IDENT + ASSESSMENT TO MAINTAIN A RESPONSIVE PDN BASE					500	750

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- FORMING/MACHINING (CONTINUED)							
(4397)	TITLE - FABRICATION OF ADVANCED WARHEADS					750	350
	PROBLEM - MANUFACTURING PROCEDURES FOR ADVANCED WARHEADS NEED TO BE ESTABLISHED.						
	SOLUTION - STUDIES TO ESTABLISH AND OPTIMIZE THE MANUFACTURING PROCESS FOR ADVANCED WARHEADS.						
(4519)	TITLE - OUTLINE AUTOMATIC DETECTION OF TOOL WEAR					40	
	PROBLEM - TOOL WEAR ON SEMIAUTOMATIC METAL MACHINES CAUSE DEFECTIVE PARTS IF UNDETECTED.						
	SOLUTION - PROVIDE AN AUTOMATIC MEASURING DEVICE ON THE TRANSPORTER OF THE LOAD/ UNLOAD SYSTEM.						
(4529)	TITLE - MFG OF PRECISION CONES FOR HEAT PROJECTILES	525	447	675			
	PROBLEM - THE HEAT PROJECTILE LINER MUST BE HELD TO .003 IN ANY TRANSVERSE PLANE AND WITHIN .006 ALONG ITS LENGTH. THE TOLERANCES ARE AT THE EXTREME LIMIT OF ACCURACY. THE XM815 LINER REQUIRES PPECISION AN ORDER OF MAGNITUDE GREATER (.0005).						
	SOLUTION - PHASE ONE WOULD EXAMINE TWO CANDIDATE PROCESSES - SHEAR FORMING AND DRAW/ANNEAL. FIFTY ROUNDS WOULD BE TESTED BY EACH PROCESS. ONE CANDIDATE PROCESS WILL BE CHOSEN FOR FURTHER DEVELOPMENT DURING THE SECOND PHASE.						
COMPONENT -- PROJECTILES							
(3209)	TITLE - POWDERED METAL (PM) FOR LOW DRAG 20-40MM PROJECTILES					475	327
	PROBLEM - LOW DRAG PROJECTILES REQUIRE SIGNIFICANT AMOUNT OF MACHINING AND INSPECTION. CONSEQUENTLY, EACH PROJECTILE IS EXPENSIVE AND THE PROCESS SEVERELY LIMITS PRODUCTION RATES.						
	SOLUTION - PM MANUFACTURING TECHNIQUES MAY INCREASE PRODUCTION RATES WHILE REDUCING COST. A SECONDARY COINING OPERATION MAY OR MAY NOT BE REQUIRED; HOWEVER, THE TOTAL MACHINING OPERATION IS REDUCED TO, AT MOST, TWO.						
(3736)	TITLE - MFG PROCESSES F/SMART TARGET FIRE AND FORGET PROJ (STAFF)					500	750
(3738)	TITLE - MFG F/GUN FIRED AIR DEFENSE ICM						500
(3739)	TITLE - MFG PROCESS F/A FAMILY OF SUBCALIBER SADARM SYSTEMS						1000
(3740)	TITLE - MFG PROCESSES F/IMPROVED STANDOFF DUAL PURPOSE ICM						1000
(3741)	TITLE - MFG PROCESSES F/ADV DESIGN ARTILLERY TRAINING AMMUNITION						1000

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- PROJECTILES (CONTINUED)							
(3745)	TITLE - IMPRVD TECH F/MFG OF 8 IN FIN STABILIZED ART PROJ (CHAMP)					500	1000
(3747)	TITLE - TECHNOLOGY F/MFG OF ADVANCED 75MM AMMUNITION					1000	1000
(4563)	TITLE - PROCESS IMPROVEMENT FOR TANK DU PENETRATOR	768	2625	3088	1322		
	PROBLEM - CURRENT PRODUCTION PROCESSES ARE INCAPABLE OF MEETING TIME CYCLES AND QUANTITIES OF D/U PROJECTILES AS PLANNED IN FACILITIZATION STUDIES.						
	SOLUTION - INVESTIGATE D/U PRODUCTION PROCESS TO REDUCE CYCLE TIMES, CONSERVE MATERIAL, IMPROVE BALLISTICS, REDUCE WASTE AND IMPROVE THE ENVIRONMENT.						
(4581)	TITLE - PRODUCTION MFG TECH FOR SFF WARHEAD LINER			383	526		
	PROBLEM - AUTOMATED METHODS TO MANUFACTURE DUCTILE STEEL SELF FORGING FRAGMENT WARHEADLINERS ARE NEEDED TO ATTAIN PROJECTED PRODUCTION QUANTITIES AND COST.						
	SOLUTION - THIS PROJECT WILL DEVELOP PARAMETERS AND METHODS FOR MANUFACTURING DUCTILE STEEL WARHEAD LINERS IN A PRECISE, LOW COST, HIGH VOLUME PRODUCTION MODE.						
(4583)	TITLE - MANUFACTURE OF STEEL FOLDING FINS					580	
	PROBLEM - THE METHOD OF PRODUCING THE FINS FOR THE XM815 HEAT-MP-T PROJECTILE INVOLVES COSTLY AND TIME CONSUMING SURFACE GRINDING RESULTING IN COST PER PROJECTILE OF $570.00.						
	SOLUTION - ALTERNATE FORMING METHODS SUCH AS ROLL FORMING DIE FORGING AND INVESTMENT CASTING WILL BE EVALUATED IN ORDER TO COME UP WITH A MORE ECONOMICAL FIN COST.						
(4597)	TITLE - MFG PROC F/CANNON CALIBER DU PENETRATOR (20MM, 25MM, 30MM)			374	450		
	PROBLEM - CURRENT FABRICATION TECHNIQUES FOR SMALL CALIBER DEPLETED URANIUM PENETRATORS RESULT IN EXCESSIVE SCRAP OF RADIOACTIVE CONTAMINANTS AND ARE HIGHLY LABOR INTENSIVE.						
	SOLUTION - DEFINE A FULL PRODUCTION PROCESS AND EQUIPMENT FOR THE MANUFACTURE OF DU PENETRATORS DIRECT FROM ROLLED BAR BY SKEWED AXIS ROLL FORMING TECHNIQUES.						

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- TOOLING							
(3707)	TITLE - WELDING TECHNOLOGY ADVANCEMENTS (AF83-7)					300	200
	PROBLEM - FAB AND MAINT COSTS OF TOOLING FIXTURES; TOOLING AND PART SAFETY FOR RESISTANCE AND TIG WELDING; EXTENSIVE WELDING SCHEDULES, TESTING, AND STRIP REQUIREMENTS FOR TAPERED MATERIALS ARE COST DRIVERS OF COMPONENTS FOR MISSILE AND ROCKET MOTOR.						
	SOLUTION - EVALUATE THE DESIGN AND MATERIALS OF CONSTRUCTION OF SHORT BARS, DEVELOP NEW TECHNIQUE UTILIZING LOW HEAD PRESSURES. THE DEVELOPMENT OF A WELDING MACHINE AND/OR PROCESS TO PERMIT VARIABLE SCHEDULES AND WELD SAMPLES WHILE IN OPERATION.						
(4164)	TITLE - ANALYSIS FOR PREDICTING FAILURE OF MFG TOOLING				163	168	
	PROBLEM - THE ABILITY TO PREDICT FAILURE OF MACHINE OR COMPONENTS IS NON-EXISTANT. FAILURES ARE COSTLY AND REDUCE PRODUTION OUTPUT.						
	SOLUTION - FREQUENCY ANALYSIS WILL IDENTIFY MACHINE PARTS WHICH ARE DEFECTIVE, OVERLOADED, OR NOT OPERATING PROPERLY.						

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* CATEGORY *
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*POLLUTION ABATEMENT *
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COMPONENT -- CHEMICAL							
(4298)	TITLE - EVALUATION OF DMN DISPOSAL ON HSAAP B-LINE	860	295				
	PROBLEM - EFFLUENT FROM AMMONIA RECOVERY COLUMN CONTAINS SIGNIFICANT AMOUNTS OF DMN. DMN IS ONE OF THE EPA CONSENT DECREE COMPOUNDS FOR WHICH WATER QUALITY CRITERIA MUST BE PROVIDED. EPA INSISTS ON LEVELS BELOW 0.3 PPB.						
	SOLUTION - EVALUATE UV PHOTOLYSIS CATALYTIC HYDROGENATION, CARBON ADSORPTION OR OTHER TECHNIQUES FOR ABATING OR DESTROYING DMN.						
COMPONENT -- GENERAL							
(4348)	TITLE - NOISE POLLUTION ABATEMENT F/SCAMP IN LCAAP						264
	PROBLEM - NOISE LEVEL EXCEEDS 85 DBS IN BLDG 1 AT LAKE CITY AAP.						
	SOLUTION - INSTALL RECOMMENDED ONE SUBMODULE NOISE SUPPRESSION SYSTEM AND EVALUATE ALL OTHER SUBMODULES.						

		FUNDING ($000)				
	PRIOR	83	84	85	86	87
COMPONENT -- PROPELLANTS/EXPLOSIVES						
(4229) TITLE - ADVANCED PINK WATER TREATMENT				460		
PROBLEM - CURRENT PINK WATER DISPOSAL ECHNIQ[illegible] A BON ADSORPTION IS HIGH IN COST EVEN WHEN REGENERATION IS						
SOLUTION - ALTERNATIVE TECHNOLOGIES [illegible] TREATMENT BY 50 PERCENT. IT IS [illegible] THAT THAT CAN BE RETROFITTED TO THE CURR[illegible] A R[illegible] THIS EM WILL BE DEVELOPED						
(4489 TITLE - ADVANCED POLLUTION ABATEMENT FOR [illegible] FACILITIES	1357	86	917	343		
PROBLEM - MUCH WORK HAS BEEN DONE IN THE PROPELLANTS AND EXPLOSIVES PLANTS TO MEET THE POLLUTION ABATEMENT STANDARDS. HOWEVER, ALL OF THE GOALS HAVE NOT YET BEEN MET.						
SOLUTION - DEVELOP TECHNOLOGY TO DISPOSE OF WASTEWATER TREATMENT SLUDGE, TO PROVIDE TERTIARY TREATMENT OF MAAP WASTEWATER, TO TREAT PINK WATER, AIR EMISSION AND DETONATOR WASTE, AND TO PROVIDE ENVIRONMENTAL IMPROVEMENTS FOR NITRATE ESTERS.						
(4511) TITLE - DISPOSAL OF FINAL SLUDGE FROM ACID RECOVERY OPERATIONS	302	582	478			
PROBLEM - SODIUM HYDROXIDE IS PRESENTLY USED TO NEUTRALIZE NITRIC ACID IN WEAK ACETIC ACID PRIOR TO ITS PRIMARY DISTILLATION AND IN THE FINAL SLUDGE TO KILL THE WASTE ROX. A BY PRODUCT OF THIS REACTION IS A LOW GRADE SODIUM NITRATE.						
SOLUTION - TO DEV AN ALTERNATIVE MORE COST EFFECTIVE PROCESS F/ NEUTRALIZATION OF NITRIC ACID CAUSTICIZING + SLUDGE. AMMONIUM ACETATE IS A RECOMMENDED ALTERNATIVE. THE BY PROD IS AMMONIUM NITRATE, A MORE VALUABLE PROD THAN SODIUM NITRATE.						
(4651) TITLE - EXPLOSIVE RECLAMATION FACILITY				320		
PROBLEM - EXISTING HI-PRESSURE WASHOUT FACILITY AT IOWA AAP HAS DEMONSTRATED REUSE AND RECIRCULATION OF PROCESS WATER. THE REMAINING PROBLEM INVOLVES WHAT TO DO WITH THE EXPLOSIVES THAT HAVE BEEN WASHED OUT.						
SOLUTION - DESIGN, INSTALL AND DEMONSTRATE A PROTOTYPE RECLAMATION SYSTEM THAT CAN BE USED IN THE HI-PRESSURE WASHOUT FACILITY AT IOWA AAP.						

		FUNDING ($000)					
	PRIOR	83	84	85	86	87
COMPONENT -- RECYCLE						
(4579) TITLE - WHITE WATER RECOVERY SYS F/COMBUSTIBLE CASE MANUFACTURING			500			

PROBLEM - A BY PRODUCT OF FORMING COMBUSTIBLE CASES ARE WASTEWATERS CONTAINING NC FINES AND OTHER CONTAMINANTS INCLUDING DPA. THE DISCHARGE LIMIT FOR DPA IS 0.026 MG/L. ESTIMATES PLACE DPA IN WASTEWATER AT 20 MG/L OR 770 TIMES THE MAXIMUM AMOUNT PERMITTED.

SOLUTION - TREAT THE WHITE WATER TO ABLE TO RECYCLE/REUSE THE WATER IN THE MAIN PROCESS. CARBON ADSURPTION FOR REMOVAL OF DPA AND MICROFILTRATION TO REMOVE NC FINES AND OTHER SUSPENDED SOLIDS/FIBERS WILL BE INVESTIGATED.

CATEGORY: PROPELLANTS

COMPONENT -- BALL						
(4540) TITLE - CALCIUM CARBONATE COATING OF 7.62MM BALL PROPELLANTS		115	322			

PROBLEM - A SAFE AND EFFICIENT PROCESS IS NOT CURRENTLY AVAILABLE FOR THE COATING OF 7.62MM BALL PROPELLANT WITH CALCIUM CARBONATE.

SOLUTION - UTILIZE AN EXISTING 2-STAGE CONTINUOUS PILOT SCALE COATER WHICH WILL BE SHIPPED FROM OLIN, ST. MARKS, FL. FACILITY TO BADGER AAP TO DEVELOP A SAFE AND EFFICIENT PROCESS TO COAT 7.62 MM BALL PROPELLANT WITH CALCIUM CARBONATE.

(4588) TITLE - SMALL CAL AUTOMATED NON-DESTRUCTIVE TEST - SCANT				901	1572	1150

PROBLEM - .50 CALIBER BALL, TRACER, ARMOR PIERCING INCENDIARY(API) AND ARMOR PIERCING INCENDIARY TRACER(APIT) AMMUNITION IS INSPECTED USING WW II GAGE AND WEIGH MACH AND VISUAL EXAM. THIS PROCESS IS SLOW, INACCRATE AND EXPENSIVE

SOLUTION - AUTOMATE THE GAGE + WEIGH PROCESS USING THE TECHNOLOGY DEVELOPED FOR 5.56MM. THE TECHNOLOGIES FOR THIS AUTOMATED PROCESS INCLUDE- OPTICS/ELECTRONICS, LASER SCATTERING, EDDY CURRENT, AND X-RAY. THE PROCESS WILL BE COMPUTER CONTROLLED.

COMPONENT -- GENERAL						
(4145) TITLE - CONTROL DRYING IN AUTO SB AND BALL PROP MFG	327		195			

PROBLEM - OFF-LINE ANALYSIS FOR MOISTURE AND VOLATILES MAKES IT DIFFICULT TO CONTROL A CONTINUOUS DRYING OPERATION SINCE THE TIME REQUIRED FOR ANALYSIS IS LONG COMPARED TO THE RESIDENCE TIME FOR THE PROPELLANT IN A CONTINUOUS DRYER.

SOLUTION - USE PRODUCT TEMPERATURE AND/OR ON-LINE ANALYZERS AND FLOW METERS AS A BASIS FOR IMPROVED CONTROL OF A CONTINUOUS DRYING OPERATION AND REDUCE THE AMOUNT OF OFF-LINE ANALYSIS REQUIRED.

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- GENERAL (CONTINUED)							
(4273)	TITLE - AUTO PRODUCTION OF STICK PROPELLANT	821		1028	612		
	PROBLEM - PRESENT BATCH TECHNIQUES FOR STICK PROPELLANT MFG INVOLVE MUCH HAND LABOR THEREBY RESULTING IN LIMITED PRODUCTION CAPACITY, HIGH COST, AND HAZARD EXPOSURE.						
	SOLUTION - INSTALL AND EVALUATE PROTOTYPE EQUIPMENT TO AUTOMATE THE TAKE-AWAY AND CUTTING OPERATIONS FOR SOLVENT-TYPE STICK PROPELLANT. THIS PROCESS WILL OPERATE WITH EXISTING 12 INCH PRESS AND PRESS BAY.						
(4533)	TITLE - LOVA PROPELLANT PROCESSING		398				
	PROBLEM - PDN OF SOLVENT PROCESS BINDER BASED LOVA PROPELLANT REQUIRES PRECISE CLASSIFICATION OF IN-PROCESS MATERIALS IN ORDER TO ASSIGN AVAILABLE PDN FACILITIES. THE USE OF UNCONVENTIONAL SOLVENTS RAISES CONCERN ABOUT POLLUTION CONTROL.						
	SOLUTION - DETERMINE HAZARD CLASSIFICATION OF MATERIALS USED TO MANUFACTURE LOW VULNERABILITY (LOVA) PROPELLANTS AND ANALYZE THEIR INFLUENCE ON FACILITIES SELECTION AND NEED. CONDUCT BENCH SCALE INVESTIGATIONS ON POLLUTION ABATEMENT AND SOLVENT RECOVERY.						
(4615)	TITLE - IMPROVED SOLVENTLESS PASTE BLENDING				953	600	
	PROBLEM - PASTE BLENDING AND FINAL BLENDING OF STICK PROPELLANT IS NOW REQUIRED. A MORE INTENSIVE PASTE BLEND MAY ALLOW ELIMINATION OR REDUCTION OF THE FINAL BLENDING STEP.						
	SOLUTION - PURCHASE, INSTALL AND EVALUATE PROTOTYPE EQUIPMENT TO IMPROVE PASTE BLENDING.						
(4660)	TITLE - AUTOMATED BLENDING OF STICK PROPELLANT				723	1875	1465
	PROBLEM - MANUAL BLENDING OF STICK PROPELLANT IS LABOR AND SPACE INTENSIVE AND CANNOT SUPPORT PRODUCTION OF LARGE QUANTITIES OF STICK PROPELLANT.						
	SOLUTION - DEVELOPMENT OF A MECHANICAL STICK BLENDER TO AUTOMATICALLY BLEND AND PACK LONG STICK PROPELLANT.						
COMPONENT -- MULTI-BASE							
(4531)	TITLE - AUTOMATED PRODUCTION OF MULTI-BASE STICK PROPELLANT ON CAMBL				898	670	893
	PROBLEM - VARIOUS HIGH ENERGY AND LOVA GRANULAR AND STICK MULTI-BASE PROPELLANTS ARE BEING DEVELOPED. BATCH FACILITIES FOR MULTI-BASE HAVE A CONSTRAINED CAPACITY. A NEW CAMBL IS BEING BUILT BUT HAS NOT PROVEN CAPABLE OF MANUFACTURING STICK PROPELLANTS.						
	SOLUTION - ADAPT RECENTLY DEVELOPED CAMBL PROCESS TO DEMONSTRATE THE MASS PRODUCIBILITY OF THE NEW PROPELLANTS. THIS WILL INSURE A PRODUCTION BASE FOR STICK PROPELLANT AND PREVENT HAVING TO USE AND/OR BUILD INEFFICIENT BATCH FACILITIES.						

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- MULTI-BASE (CONTINUED)							
(4544)	TITLE - DEVELOP A THIRD GENERATION DYNAGUN TO SIMULATE TANK GUNS			416	317		
	PROBLEM - STANDARD BALLISTIC EVALUATION TESTS ARE THE ONLY MEANS AVAILABLE FOR ASSESSING PROPELLANTS FOR HIGH PRESSURE/HIGH VELOCITY SYSTEMS SUCH AS THE 105MM AND 120MM TANK GUNS. THESE PROCEDURES ARE VERY EXPENSIVE AND TIME CONSUMING.						
	SOLUTION - DEVELOP A THIRD GENERATION DYNAGUN WHICH CAN BE USED IN LIEU OF STANDARD BALLISTIC TESTS AS A MORE RAPID AND LESS COSTLY MEANS OF ASSESSING PROPELLANTS FOR THE 105MM AND 120MM TANK GUNS.						
(4572)	TITLE - IMPROVED BATCH PROCESSING OF MULTI BASE PROPELLANTS				427	980	876
	PROBLEM - BATCH MANUFACTURE OF MULTI-BASE PROPELLANTS REQUIRES MANY OPERATIONS WHICH ARE LABOR INTENSIVE DIFFICULT TO CONTROL AND HAZARDOUS TO THE OPERATORS.						
	SOLUTION - PROVIDE PROTOTYPE EQUIPMENT TO IMPROVE, SIMPLIFY AND COMBINE OPERATIONS IN BATCH PROCESSING OF MULTI-BASE PROPELLANTS BOTH GRANULAR AND STICK TO REDUCE COST AND OPERATOR HAZARD.						
(4656)	TITLE - NITRAMINE PROPELLANT PROCESSING				594		
	PROBLEM - NITRAMINE CONTAINING GUN PROPELLANTS SUCH AS LOVA AND GAU-8 PROP ARE PRESENTLY PRODUCED BY A DISCONTINUOUS, MANPOWER INTENSIVE, INEFFICIENT BATCH PROCESS. PRODUCT UNIFORMITY IS DIFFICULT TO OBTAIN DUE TO IMPRECISE CONTROLS.						
	SOLUTION - DEVELOP A CONTINUOUS PROCESSING OPERATION FOR THE MANUFACTURE OF LOVA AND OTHER NITRAMINE PROPELLANTS BY THE USE OF NOS SCREW EXTRUDER, AUTOMATIC FEEDS AND CUTTERS WILL DECREASE COST AND IMPROVE SAFETY.						
COMPONENT -- NITROGUANIDINE							
(4061)	TITLE - NITROGUANIDINE PROCESS OPTIMIZATION	2548	640				
	PROBLEM - A NITROGUANIDINE FACILITY IS UNDER CONSTRUCTION AT SAAP TO BE OPERATIONAL IN FY80. IT UTILIZES PROCESSES NOT PREVIOUSLY USED COMMERICALLY AND IT CONTAINS MANY RECIRCULATION AND SUPPORT LOOPS, THE OPERATION OF WHICH ARE STRONGLY INTERDEPENDENT.						
	SOLUTION - CONDUCT PROCESS IMPROVEMENT PROCEDURES USING NITROGUANIDINE SUPPORT EQUIPMENT (NSE) INSTALLED UNDER PROJECT 5752632, AND APPLY EVOLUTIONARY OPERATION (EVOP) TO THE NITROGUANIDINE FACILITY BEING CONSTRUCTED AT SUNFLOWER APP.						

	FUNDING ($000)				
PRIOR	83	84	85	86	87

COMPONENT -- SINGLE BASE

(4573) TITLE - COMBINED CPD, MIX AND EXTRUSION FOR S.B. PROPS — 85: 441; 86: 1513; 87: 1478

PROBLEM - BATCH MANUFACTURE OF SINGLE BASE PROPELLANTS REQUIRES OPERATIONS WHICH ARE LABOR INTENSIVE, DIFFICULT TO CONTROL AND HAZARDOUS TO THE OPERATORS.

SOLUTION - THIS PROJECT WILL PROVIDE PROTOTYPE EQUIPMENT TO IMPROVE, SIMPLIFY AND COMBINE OPERATIONS IN BATCH PROCESSING OF SINGLE BASE PROPELLANTS TO REDUCE COST AND OPERATOR HAZARDS.

(4605) TITLE - PROPELLANT BED DEPTH CONTROL IN CASBL AIR DRY — 83: 579

PROBLEM - RADFORD AAP HAS ENCOUNTERED PROBLEMS IN CONTROLLING BED DEPTH DURING DRYING OF SINGLE BASE PROPELLANT.

SOLUTION - A SYSTEM FOR THE AUTOMATIC BED DEPTH SENSING AND CONTROL INSTRUMENTATION WILL BE DEVELOPED FOR THE AIR DRY MODULES IN CASBL.

CATEGORY
QUALITY CONTROL/TESTING

COMPONENT -- INSPECTION

(3717) TITLE - APPLICATION OF RAPID X-RAY TECHNIQUE — 86: 2100

PROBLEM - IN HIGH G SHELL IT IS IMPORTANT THAT THERE ARE NO RESIDUAL STRESSES AFTER MANUFACTURE TO INSURE NO MALFUNCTIONS DURING FIRING OVER FRIENDLY FORCES.

SOLUTION - COUPLE APPLICABLE ELECTRONICS AND A COMPUTER TO A CONVENTIONAL X-RAY GENERATOR TO PRODUCE ACCURATE STRESS DETERMINATION ON A CONTINUOUS PRODUCTION LINE.

(3718) TITLE - CONTINUOUS EVALUATION OF THE PROTECTIVE COATINGS — 86: 1800; 87: 2100

PROBLEM - ARTILLERY SHELLS ARE GIVEN PROTECTIVE COATINGS AND SAMPLES FROM EACH LOT ARE EVALUATED DURING PRODUCTION IN THE STANDARD ASTM B117 SALT SPRAY TEST (REQUIRES 2-4 DAYS).

SOLUTION - CONTINUOUS SCANNING PROBE IMPEDANCE TECHNIQUES WILL PERFORM 100 PCT PROTECTIVE COATING CHECKS.

(4358) TITLE - AUTO LINE - PROCESS INSPECTION OF NEW EED (ALPINE) — 84: 384; 85: 748

PROBLEM - INSPECTION OF BRIDGE WIRE ON ELECTRIC DETONATORS.

SOLUTION - AUTOMATE THE TESTING TECHNOLOGY DEVELOPED BY TTT ARRADCOM 12-78, 'ELECTROTHERMAL ANALOG RESPONSE INSPECTION OF EED?S' FOR FINAL END ITEM NONDESTRUCTIVE ACCEPTANCE INSPECTION.

		FUNDING ($000)				
	PRIOR	83	84	85	86	87
COMPONENT -- INSPECTION (CONTINUED)						
(4471) TITLE - CONICAL SURFACE INSPECTION					337	197
PROBLEM - NO SATISFACTORY AUTOMATED INSPECTION EQUIPMENT IS KNOWN TO ACCOMPLISH THE VARIOUS CONICAL SURFACE INSPECTIONS FOR CONVENTIONAL AND ADVANCED SHAPED CHARGE LINERS.						
SOLUTION - PROVIDE AN AUTOMATED INSPECTION SYSTEM COMPATIBLE WITH PROPOSED CONVENTIONAL AND SHAPED CHARGE TECHNOLOGY PROGRAMS. SPECIFICALLY FOR CONICAL SURFACE MEASUREMENTS.						
COMPONENT -- NON-DESTRUCTIVE TESTING						
(3719) TITLE - APPLICATION OF X-RAY SYSTEM SCANNER 100 PCT						2200
PROBLEM - IN THE CURRENT METHOD OF TESTING THE METALLURGICAL PROPERTIES OF SHELL, DESTRUCTIVE SAMPLES MUST BE TAKEN CONTINUOUSLY IN PRODUCTION						
SOLUTION - DEVELOP A RAPID AND EFFECTIVE NDT METHOD TO CONTINUOUSLY VERIFY THE TENSILE AND HARDNESS PROPERTIES OF EACH SHELL PRODUCED.						
(4473) TITLE - AUTO LEAK DETECTION OF WP MUNITIONS			410	230	220	
PROBLEM - THE CURRENT METHOD OF HEATING THE WHITE PHOSPHOROUS MUNITIONS TO CHECK FOR LEAKS IS LABOR INTENSIVE AND IS NOT UNIFORM FOR ALL ROUNDS.						
SOLUTION - PROVIDE A PROTOTYPE AUTOMATED IN-LINE LEAK DETECTION SYSTEM BASED ON QUANTITATIVE FLAME PHOTOMETERY. THE SYSTEM WILL CONSIST OF TWO HEATING STAGES, A SAMPLING WHEEL, LEAK DETECTOR AND HANDLING SYSTEM.						
(4598) TITLE - AUTO NON-DEST DENSITY DETERMINATION EXPLOSIVE PROJECTILES				414		
PROBLEM - THE DENSITY OF THE EXPLOSIVE IN MILITARY PROJECTILES IS A KEY INDICATOR OF LEAD QUALITY AND SAFETY. THE METHOD IS TIME CONSUMING AND COSTLY AND DOES NOT PERMIT THE MEASUREMENT OF A STATISTICALLY VALID SAMPLE SITE.						
SOLUTION - THIS PROGRAM WILL REPLACE THE CURRENT MANUAL METHOD FOR DESTRUCTIVE DETERMINATION OF DENSITY IN PRESS-LOADED PROJECTILES WITH A SEMI-AUTOMATIC NONDESTRUCTIVE METHOD USING PENETRATING RADIATION.						
COMPONENT -- SIMULATION						
(2856) TITLE - SHOCK IMPULSE HYDROSTATIC TESTING					205	
PROBLEM - BALLISTIC ACCEPT TEST OF METALLIC CARTRIDGE CASES UTILIZES 100 SAMPLE ITEMS LOADED INTO COMPLETE ROUNDS + FIRED AT A PG. THIS TEST CONSITITUES APPROX 50 PERCENT OF ALL BALLISTIC ACCEPT TEST DONE ON ENTIRE ROUND REQUIRED TO PRODUCT ROUND.						
SOLUTION - A SHOCK IMPULSE HYDROSTATIC PRESSURE TESTER DEV TO TEST COMPONENT CARTRIDGE CASE IN-PLANT W/O NEED OF ASSEMBLING INTO A FULL-UP ROUND WHILE STILL SIMULATING INTERIOR BALLISTIC PULSE WILL MINIMIZE EXPENSE OF TESTING BALLISTICALLY.						

		FUNDING ($000)				
	PRIOR	83	84	85	86	87

COMPONENT -- X-RAY

(4545) TITLE - DIGITAL IMAGE AMPLIFICATION X-RAY SYSTEM — 85: 944; 86: 388

PROBLEM - EXISTING IMAGE AMPLIFICATION X-RAY DOES NOT MEET THE IMAGE QUALITY CRITERIA TO BE USED AS AN INSPECTION TOOL FOR HE MORTAR ROUNDS. FILM RADIOGRAPHY, AS CURRENTLY USED, IS LABOR INTENSIVE, TIME CONSUMING, AND SUBJECT TO HUMAN INTERPRETIVE JUDGEMENT.

SOLUTION - REPLACE WITH AN IMPROVED REAL-TIME IMAGE AMPLIFICATION SYSTEM. TECHNIQUES FOR DIGITAL IMAGE ENHANCEMENT AND ANALYSIS DEVELOPED UNDER THE AXIS PROJECT WILL BE ADOPTED.

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* CATEGORY *
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*SAFETY *
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COMPONENT -- GENERAL

(2741) TITLE - LIGHTNING WARNING SYSTEM FOR MUNITION PLANT SAFETY — 86: 150; 87: 500

PROBLEM - AS THE ELECTRONICS ADOPTED IN THE DESIGN OF AAP'S BECOMES MORE SOPHISTICATED AND COSTLY, THE NEED FOR QUICK AND RELIABLE LIGHTNING PROTECTION INCREASES.

SOLUTION - IMMEDIATE EVALUATION OF AUSTRAILIAN (E.F. AUSTRALASIA) LIGHTNING PROTECTION SYSTEM AND SUBSEQUENT STATE OF THE ART ADVANCEMENT.

(4071) TITLE - EXPLOS PREVENTION IN DRY DUST COLLECTION SYSTEMS — PRIOR: 461; 86: 442

PROBLEM - POTENTIALLY HAZARDOUS CONDITIONS EXIST IN DRY DUST COLLECTION SYSTEMS THROUGHOUT THE MUNITIONS PRODUCTION BASE. PRESENT DATA ON DETONATION CHARACTERISTICS OF EXPLOSIVE, PROPELLANT OR PYROTECHNIC DUST ARE INCOMPLETE/INADEQUATE TO IMPROVE SAFETY.

SOLUTION - DEVELOP DATA TO ESTABLISH SAFE OPERATING PARAMETERS FOR DUST COLLECTION SYSTEMS. UTILIZE THESE DATA TO DEVELOP FAIL-SAFE COLLECTION SYSTEM DESIGNS WHICH PREVENT DUST EXPLOSIONS BY EMPLOYMENT OF PROPER VENTING, LIMITING IGNITION ENERGY, ETC.

(4291) TITLE - BLAST EFFECTS IN THE MUNITIONS PLANT ENVIRONMENT — PRIOR: 1373; 85: 347

PROBLEM - MOST OF THE DESIGN EFFORT IS IN THE AREA OF LACE REINFORCED STRUCTURES FOR CLOSED IN AREAS TO AN EXPLOSION. WE MUST ATTEMPT TO UTILIZE CCM CONSTRUCTION MATERIAL.

SOLUTION - TO STUDY CHARACTERISTICS OF THE BLAST ENVIRONMENT AND DETERMINE THE RESPONSE OF THE VARIOUS STRUCTURAL MATERIALS AND ELEMENTS SUBJECTED TO THESE LOADING.

		FUNDING ($000)				
	PRIOR	83	84	85	86	87
COMPONENT -- LAP						
(4374) TITLE - EXPLOSIVE SAFETY SHIELDS				225		
PROBLEM - ACRYLIC MATL IS USED AS A PROTECTIVE SHIELD ON LOADING LINES WHERE LOADING OF SMALL QUANT OF HIGHLY SENSITIVE EXPLOSIVE OCCURS. NO DATA ON BLAST CAP OF THE MATL IS AVAIL + WORK MUST BE DONE ON A CASE-BY-CASE BASIS.						
SOLUTION - DETERMINE BLAST CAP OF ACRYLIC MATLS + PREP DESIGN GUIDANCE F/FUTURE USE. TECH REPORTS FOR DESIGN GUIDANCE OF THIS TYPE OF PROTECTIVE SHIELDS WILL BE DEV TO PRECLUDE CASE-BY-CASE METHOD NOW USED.						
COMPONENT -- PROPELLANTS/EXPLOSIVES						
(4318) TITLE - OCCUPATIONAL EXPOSURE TO NITRATE ESTERS IN MUNITION MFG				100	250	
PROBLEM - THE THRESHOLD LIMIT VALUE FOR NITROGLYCERIN AND OTHER NITRATE ESTERS MAY BE REDUCED FROM 0.2 PPM TO 0.02 PPM. THIS COULD INVOLVE EXTENSIVE REDESIGN ON ALL FACILITY PROJECTS INVOLVING NG OR NITRATE ESTERS.						
SOLUTION - UTILIZE MORE EFFECTIVE VENTILATION OR CHEMICAL ENTRAPMENT, REMOTE AUTOMATIVE OPERATIONS, DEVELOP PROTECTIVE CLOTHING AND AIR RESPIRATORS.						
(4453) TITLE - *PROPAGATION DISTANCE FOR ENERGETIC MATERIALS*		213	209	200		
PROBLEM - THE EXISTING SAFETY MANUAL (AMCR 385-100) HAS BECOME ANTIQUATED BY RECENT ADVANCES IN WEAPONS TECHNOLOGY. THERE IS A NEED TO UPGRADE ACCIDENTAL DETONATION SUPRESSION CRITERIA.						
SOLUTION - A SERIES OF PROPAGATION SUPPRESSION CRITERIA TESTS ON VARIOUS ENERGETIC MATERIALS WILL BE CONDUCTED. THE SAMPLE CONFIGURATIONS WILL SIMULATE STAGES OF END ITEM MANUFACTURE AND ASSEMBLY.						
(4565) TITLE - *ULTRA HIGH SPEED FIRE PROTECTION SYSTEM*				250		
PROBLEM - SAFETY REG LARCOMR 385-100 REQUIRES CERTAIN HAZARDOUS OPERATIONS TO BE EQUIPPED WITH FIRE PROTECTION SYSTEMS THAT CAN PROVIDE SUPPRESSANT ON FIRES WITHIN 50 MSECS FROM THE TIME OF THEIR DETECTION.						
SOLUTION - A COMPREHENSIVE INVESTIGATION (INCLUDING TESTS) WILL BE CONDUCTED TO DETERMINE IF 50 MSEC REQUIREMENT IS REASONABLY ACHIEVABLE (BOTH TECHNICALLY AND ECONOMICALLY) ON PRACTICAL SYSTEMS USING EXISTING FIRE SUPPRESSANT TECHNOLOGY.						
(4617) TITLE - EQUIVALENT DESIGN VALUES F/CLOSE IN APPLICATIONS				230	150	
PROBLEM - DATA IS LACKING ON THE OUTPUT OF VARIOUS EXPLOSIVES OF DIFFERING SHAPES AT SCALED DISTANCES LESS THAN 3 FT/LB ONE THIRD. CURRENT VALUES AT GREATER DISTANCES ARE EXTRAPOLATED IN FOR ESTIMATING.						
SOLUTION - CONDUCT TESTS ON VARIOUS EXPLOSIVES TO DETERMINE THEIR EQUIVALENT DESIGN WEIGHTS RELATIVE TO TNT AT CLOSE-IN SCALED DISTANCES.						

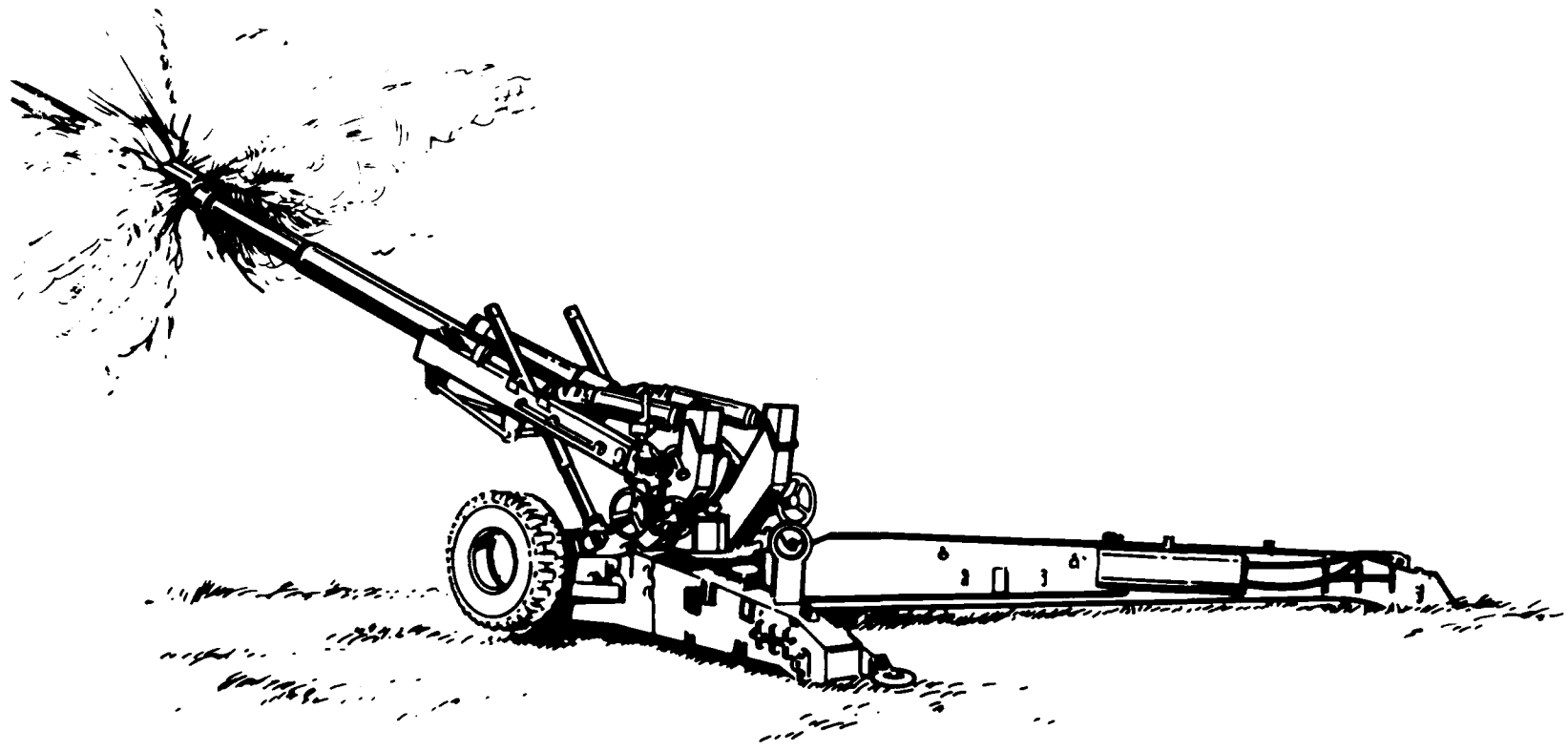
		FUNDING ($000)				
	PRIOR	83	84	85	86	87
COMPONENT -- PROPELLANTS/EXPLOSIVES (CONTINUED)						
(4621) TITLE - FIRE SPREAD + CRITICAL HEIGHT CHARACTERIZATION				225	225	
PROBLEM - FIRE SPREAD RATES OF PROPELLANTS STORED IN LOADING HOPPERS AND BINS HAVE NOT BEEN ESTABLISHED.						
SOLUTION - FLAME SPREAD RATIOS AND CRITICAL HEIGHTS FOR VARIOUS PROPELLANTS AND EXPLOSIVES WILL BE DETERMINED TO ESTABLISH SAFE LEVELS OF OPERATION.						

CATEGORY: SMALL ARMS

COMPONENT -- GENERAL						
(4351) TITLE - IMPROVED STORAGE TECHNOLOGY FOR PRODUCTION MACHINE				421		319
PROBLEM - NEED TO OVERCOME DEGRADATION OF ELECTRONIC COMPONENTS + MEET RAPID REACTIVATION OF AUTO PDN LINES F/MOB REQUIREMENTS.						
SOLUTION - DEVELOP PACKAGING TECHNIQUE AND USE OF DRY NITROGEN FOR SCAMP EQUIPMENT.						
(4464) TITLE - COMPUTER/GROUP TECHNOLOGY FOR SMALL CAL AMMO					269	225
PROBLEM - PRESENTLY THERE IS NO METHOD TO OPTIMIZE DESIGN OF TOOLING AND TO SELECT PROPER EQUIPMENT FOR SMALL CALIBER AMMO.						
SOLUTION - INVESTIGATE POSSIBLE USE OF COMPUTER FOR OPTIMUM TOOL AND EQUIPMENT DESIGN, AND TO PREDICT PROCESS PARAMETERS AND COSTS.						
(4539) TITLE - AUTOMATIC CARTRIDGE CASE HARDNESS MEASUREMENT			182	403		
PROBLEM - MANUAL MEASUREMENTS BY SAMPLING METHODS ARE INADEQUATE AND COSTLY.						
SOLUTION - DIRECT EDDY CURRENT TECHNIQUE WOULD PROVIDE CONTINUOUS AND 100% INSPECTION						
COMPONENT -- 5.56MM - .30 CAL						
(2743) TITLE - IMPROVED TECH FOR SMALL CALIBER AMMUNITION					500	1000
PROBLEM - THE SMALL ARMS MUNITION PRODUCTION BASE MUST KEEP ABREAST OF THE RAPIDLY EMERGING NEW MANUFACTURING TECHNIQUES ON A COST/PRODUCTIVITY BASIS.						
SOLUTION - CONTINUALLY MONITOR THE SMALL ARMS DEVELOPMENTS AND APPLICABLE EMERGING MANUFACTURING TECHNOLOGY.						

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- 5.56MM - .30 CAL (CONTINUED)							
(4534)	TITLE - SAWS BULLET CONVERSION OF SCAMP EQUIPMENT	260	812	1723			
	PROBLEM - AN AMERICANIZED VERSION OF BELGIUM SS-109 WILL BE USED IN THE SAW SYSTEM. THIS EFFORT IS DIRECTED TOWARD DEVELOPMENT OF CONVENTIONAL PROCESSES TO MASS PRODUCE SAWS AMMUNITION ON SCAMP EQUIPMENT.						
	SOLUTION - THIS PROJECT WILL DEFINE PROCESSES AND EQUIPMENT/TOOLING CHANGES REQUIRED ON SCAMP LINE. INITIATION OF THESE EFFORTS THIS YEAR WILL PROVIDE PROCESS EQUIPMENT SPECIFICATIONS FOR IMPLEMENTATION IN SUFFICIENT TIME TO MEET FY87 AND ON REQUIREMENTS.						
(4538)	TITLE - 5.56MM SAWS LINK ORIENTOR AND FEED SYSTEM		398				
	PROBLEM - THE M27 LINKS ARE MANUALLY ORIENTED AND PACKED AT THE LINK MANUFACTURERS. AT THE LOADING PLANT, LINKS MUST BE MANUALLY UNPACKED AND FED INTO THE LINKING MACHINES, WHICH IS TIME CONSUMING AND COSTLY.						
	SOLUTION - BY DEVELOPING RANDOM ORIENTOR EQUIPMENT, THE LINK MANUFACTURERS WILL BE ABLE TO SHIP LINKS IN BULK TO THE LOADING PLANT; THUS, ELIMINATING MANUAL PACKING, UNPACKING, AND COST OF CARTONS.						
(4541)	TITLE - AUTO PRIMER INSERT LACQUER AND ANVIL PRESENCE INSPECT SYS			374			
	PROBLEM - LACQUER INSPECT AT GAGE + WEIGH IS BEING ELIMINATED. THE PRIMER INSERT SUBMODULE CURRENTLY INSPECTS FOR PRIMER ANVIL WITH A PROBE. TO IMPROVE EFFICIENCY, A BACK-UP INSPECTION IS DESIRED CAPABLE OF BEING INSTALLED ON EXISTING EQUIPMENT.						
	SOLUTION - A FLORESCENT DYE WILL BE ADDED TO THE PRIMER LACQUER TO BE DETECTED BY TWO DETECTORS. THE BACK-UP INSPECTION OF PRIMER ANVIL WILL BE EVALUATED BY USING A NONCONTACT EDDY CURRENT PROBE.						
COMPONENT -- .50 CAL AND LARGER							
(5021)	TITLE - HOT FORMING OF P/M PROJ BODIES					170	127
	PROBLEM - CURRENT METHODS OF FABRICATING CANNON CALIBER ROUNDS REQUIRES EXTENSIVE MACHINING TO REMOVE 60-70 PERCENT OF THE STARTING MATERIAL.						
	SOLUTION - FABRICATE PROJECTILE BODIES BY UTILIZING POWDER METALLURGY (P/M) HOT FORMING INTO THE DESIRED SHAPE.						
(4584)	TITLE - LOADING EQUIPMENT FOR CAL .50 AMMUNITION				650	2010	
	PROBLEM - THE INCREASED REQUIREMENTS FOR .50 CAL AMMUNITION IS IN EXCESS OF THE CAPACITIES OF CURRENT PRODUCTION EQUIPMENT.						
	SOLUTION - INVESTIGATE CURRENT AND PROPOSED EQUIPMENT TO DETERMINE THE MOST COST EFFECTIVE. PRODUCE A PROTOTYPE SYSTEM THAT WILL MEET THE ANTICIPATED PRODUCTION RATES.						

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- .50 CAL AND LARGER (CONTINUED)							
(4585)	TITLE - SABOT LAUNCHED ARMOR PENETRATOR (SLAP) AMMO MFG PROCESSES					1055	350
	PROBLEM - THE MFG OF SLAP AMMUNITION REQUIRES THE DEVELOPMENT OF PROTOTYPE EQUIPMENT AND TOOLING TO PROVIDE THE MOST COST EFFECTIVE PRODUCTION.						
	SOLUTION - PROCESSES AND EQUIPMENT WILL BE DEMONSTRATED TO COLD FORM THE AREA MULTIPLIER, TO AUTOMATE AREA MULTIPLIER FEEDING AND SABOT MOLDING, TO FABRICATE PENETRATORS FROM POWDER METAL AND TO ASSEMBLE THE SABOT/PENETRATOR/CARTRIDGE.						
(4596)	TITLE - PRODUCTION PROCESSES FOR CALIBER .50 PLASTIC BLANK AMMO				412	3563	638
	PROBLEM - THERE IS CURRENTLY NO PRODUCTION EQUIPMENT TO PRODUCE THE PLASTIC CASED CAL .50 BLANK ROUND IN LARGE QUANTITIES. THIS IS A NEW CONFIGURATION REQUIRING NEW PRIMING AND LAP TECHNIQUES.						
	SOLUTION - THE PRODUCTION REQUIREMENTS WILL BE MET EITHER BY MODIFYING A SCAMP MOD B LOADING MACHINE OR A COMMERCIAL SHOT SHELL PRIMING AND LOADING MACHINE. EITHER OPTION IS SUFFICIENT TO MEET REQUIREMENTS.						
(4642)	TITLE - CAL .50 CARTRIDGE FEEDING				360		
	PROBLEM - CALIBER .50 CARTRIDGES HAVE TO BE FED INTO THE INSPECTION AND LINKING MACHINES BY HAND. THE OPERATION IS EXPENSIVE AND WILL NOT BE FAST ENOUGH TO MEET THE FYDP RATES AS CURRENTLY PLANNED.						
	SOLUTION - A PROTOTYPE FEEDER CAPABLE OF FEEDING ALL TYPES OF BRASS (AND POSSIBLY THE PROPOSED PLASTIC BLANK) 0.50 CAL AMMUNITION. DESIGN OPERATING RATE OF THE EQUIPMENT WILL BE 240 TO 400 PPM.						
(4643)	TITLE - AUTO LINKING OF CAL .50 AMMUNITION				400		
	PROBLEM - THE CURRENT LINKING AND PACKAGING OPERATION AT LCAAP FOR CAL 50 AMMUNITION IS LABOR INTENSIVE AND SLOW. THE CURRENT LINKERS ARE A MAINTENANCE PROBLEM DUE TO THE LACK OF A TDP AND REPLACEMENT PARTS.						
	SOLUTION - A MODERN LINKING SYSTEM WILL BE DEVELOPED FOR THE M9 AND M15A2 LINKS THAT WILL OPERATE AT 400 PPM. THE LINKER WILL BE BASED ON THE SCAMP MODULE B CONCEPT (20MM) AND THE LINK INSPECTION MACHINE WILL BE BASED ON THE 5.56MM SAWS CONCEPT.						
(4645)	TITLE - AUTOMATED CUP INSPECTION				500		
	PROBLEM - THE CURRENT INSPECTION TECHNIQUES ARE LABOR INTENSIVE AND DO NOT ALWAYS CHECK ALL CRITICAL PARAMETERS. TOOL BREAKAGE AND HIGH SCRAP RATES CAN RESULT FROM OUT-OF-SPEC CARTRIDGE CUPS.						
	SOLUTION - A 30 PPM AUTOMATED FILL AND FORGET INSPECTION MACHINE WILL BE DESIGNED TO MEASURE DIMENSIONS AND RELATIVE HARDNESS. THE MACHINE WILL BE CAPABLE OF INSPECTION AND DATA ANALYSIS FOR UP TO 10,000 PIECES IN 8 HOURS.						



ARMAMENT, MUNITIONS AND CHEMICAL COMMAND
(AMCCOM)
(WEAPONS)

WEAPONS PROGRAM

The major portion of the weapons related MMT projects are conducted by two AMCCOM arsenals; Watervliet Arsenal (WVA) and Rock Island Arsenal (RIA). The main emphasis of their programs is the modernization and upgrading of operations through the REARM program. The purpose is to reduce costs and improve product quality by taking advantage of the advances in metalworking technology.

Many of the projects planned for FY83-87 at Watervliet Arsenal are related, in whole or in part, to the handling and fixturing of cannon tubes and their components. Since many items produced at Watervliet are large, complex and/or require close tolerances, the setup and movement time are important cost drivers.

A major cost driver at WVA is metal removal. Since the alloys used in weapons are expensive and difficult to work, producing components close to final shape will reduce the cost and time required for finishing. Methods being explored include hot isostatic pressing (HIP) and powder metallurgy (PM). Projects are also proposed to improve the metal removal process. High speed metal removal is addressed in several projects as are efforts proposed to perform multiple operations at one time. Some of the other areas in the Watervliet submission include group technology, computer-aided manufacturing, non-traditional surface hardening methods, chromium plating, and finding substitutes for critical materials.

Cost reductions and productivity increases in manufacturing continue to be the prime objectives of MMT at Rock Island Arsenal. Because RIA is a job-shop organization, administration and planning overhead is a significant cost driver. By developing an integrated computer-aided manufacturing/managment information system the Arsenal will be able to efficiently control all operations from receipt of an order to delivery of the product. Some of the management areas addressed include process modeling, performance measurement, computer-aided work measurement system, and online production information system. Cost benefits are also expected from improved material handling and in-process control projects which are tied into the overall CAM/MIS effort at RIA. Efforts in this area include robot loading of machines, and automated process control.

Since RIA's task is primarily metalworking, there are several projects included in this area. While all efforts will in themselves reduce costs, coupling with the Arsenal's overall CAM/MIS will further increase the benefits. Some of the areas covered include casting, welding, and electro-chemical grinding.

AMCCOM

COMMAND FUNDING SUMMARY
(THOUSANDS)

CATEGORY	FY83	FY84	FY85	FY86	FY87
FIRE CONTROL	0	652	1531	730	885
GENERAL MANUFACTURING	1556	4968	3427	5005	5945
LARGE CALIBER	1918	3349	3202	1985	2340
POLLUTION ABATEMENT	0	0	200	95	100
QUALITY CONTROL/TESTING	0	455	1216	1455	150
SMALL CALIBER	161	199	1493	1320	1470
TOTAL	3635	9623	11069	10590	10890

CATEGORY	FUNDING ($000) PRIOR	83	84	85	86	87
FIRE CONTROL						
COMPONENT -- ASSEMBLIES						
(8321) TITLE - ADHESIVE BONDING FC SYSTEMS					130	230
PROBLEM - CURRENT ASSEMBLY METHODS DO NOT TAKE FULL ADVANTAGE OF THE MANY ADVANCED ADHESIVE SYSTEMS AVAILABLE. MANY OPERATIONS COULD BE CONVERTED WITH SIGNIFICANT SAVINGS IN BOTH TIME AND MONEY AND WITH INCREASED RELIABILITY.						
SOLUTION - SELECT A SERIES OF ASSEMBLY OPERATIONS AS CANDIDATES FOR ADHESIVE BONDING, DESIGN BONDING SYSTEMS, APPLY, TEST AND EVALUATE. PREPARE PROCESS SPECIFICATIONS FOR THE SUCCESSFUL SYSTEMS.						
COMPONENT -- GENERAL						
(8327) TITLE - COMPUTER INTEGRATED MFG (CIM F/FC MATERIAL) (CAM)					210	225
PROBLEM - MANUFACTURING METHODOLOGIES AND THE APPLICATION OF CAD AND CAM TO FC MANUFACTURING HAS ONLY PRODUCED ISOLATED IMPROVEMENTS AND MANY OF THE MAJOR PRODUCTION PROBLEMS STILL PREVAIL.						
SOLUTION - A SYSTEMS APPROACH WITH COMPUTER INTEGRATED MANUFACTURING METHODOLOGIES TO ESTABLISH A CLOSE-LOOP SYSTEM FOR THE DESIGN-THROUGH MANUFACTURING PROCESS FOR FC, INCLUDING PLANNING ENGINEERING, QA, AND DECISION MAKING.						
COMPONENT -- OPTICS						
(8262) TITLE - PRODUCTION METHODS FOR OPTICAL WAVE GUIDES	480		192	421		
PROBLEM - MANUFACTURE OF INTEGRATED WAVEGUIDES IS COMPLICATED AND TIME CONSUMING INVOLVING PROCESSES RELATED TO METHODS USED TO MAKE SEMICONDUCTOR INTEGRATED CIRCUITS.						
SOLUTION - USE ION IMPLANTATION TO ALTER OPTICAL PROPERTIES OF GALLIUM ARSENIDE AND PHOSPHIDE SUBSTRATES TO DIRECTLY FORM OPTICAL WAVEGUIDES IN A ONE-STEP PROCESS.						
(8329) TITLE - FIRE CONTROL OPTICAL DEVICES NEW PROCESS PRODUCTION TECH			460	630		
PROBLEM - PRODUCTION DELAYS AND COST OF REWORKS HAVE BEEN A GREAT LOGISTICS PROBLEM. THERE HAS BEEN A SIGNIFICANT SHORTFALL IN PRODUCTION CAPABILITY.						
SOLUTION - ASSESSMENT OF NEW PROCESS TECHNOLOGY, UPDATED EQUIPMENT AND OPTIMIZED PROCESSES IS NECESSARY FOR THE ASSEMBLY OF A PILOT PRODUCTION LINE CAPABLE OF DEMONSTRATING HIGH SPEED PRODUCTION AND IMPROVED INSPECTION TECHNIQUES.						
(8365) TITLE - RADIAL GRADIENT INDEX OPTICS				480	220	245
PROBLEM - GRADIENT INDEX OPTICAL ELEMENTS CAN IMPROVE THE PERFORMANCE OF ARMY OPTICAL SYSTEMS AND REDUCE PRODUCTION COST. RADIAL INDEX OPTICS HAVE BEEN PRODUCED UNDER LAB CONDITIONS BUT NOT IN LARGE SCALE.						
SOLUTION - VAPOR PHASE AXIAL DEPOSITION OR ELECTRIC FIELD ASSISTED DIFFUSION USED TO PRODUCE RADIAL GRADIENT INDICES IN OPTICAL ELEMENTS ON A LAB SCALE WILL BE EXPANDED TO ENABLE PILOT PRODUCTION OF OPTICAL BLANKS.						

	FUNDING ($000)					
	PRIOR	83	84	85	86	87
COMPONENT -- OPTICS (CONTINUED)						
(8467) TITLE - DIAMOND POINT TURNING OF GLASS OPTICS					170	185
PROBLEM - THE GENERATION OF UNCONVENTIONAL AND EXTREMELY ASPHERICAL-OPTIC SURFACES HAVE BEEN DIFFICULT AND EXPENSIVE TO MAKE BY CONVENTIONAL TECHNIQUES. RECENT DEVELOPMENTS HAVE ESTABLISHED A BASIS FOR DIAMOND TURNING OF GLASS OPTICS.						
SOLUTION - INVESTIGATE AND APPLY N/C PRECISION MACHINING AND POSITIONAL MEASUREMENT FEEDBACK SYSTEMS FOR DIAMOND TURNING SMOOTH DAMAGE FREE GLASS SURFACES AND APPLY THE ADVANCES IN THE METROLOGY FOR THESE SURFACES.						

CATEGORY

GENERAL MANUFACTURING

COMPONENT -- EQUIPMENT

(7417) TITLE - LASER WELDING TECHNOLOGY FOR WEAPON COMPONENTS						100
PROBLEM - THERE ARE LIMITS ON THE SMALLEST SIZE OR THICKNESS OF A COMPONENT THAT CAN BE CONVENTIONALLY WELDED. DISTURTION PROBLEMS EXIST ON SOME LARGER PARTS WITH BOTH CUTTING AND WELDING. THE HEAT AFFECTED ZONE AROUND THE WELD OR CUT IS EXCESSIVE.						
SOLUTION - USING A LASER WELDING/CUTTING SYSTEM, THE ENERGY IS MORE ACCURATELY DIRECTED SO THAT HEATING IS LOCALIZED IN THE DESIRED AREA. SMALLER PARTS CAN BE WELDED OR CUT, DISTORTION CAN BE REDUCED AND THE HEAT AFFECTED ZONE CAN BE REDUCED.						
(7615) TITLE - AUTOMATED FORGING OF WEAPON COMPONENTS (CAM RELATED)						270
PROBLEM - PRESENT FORGING METHODS ARE COMPARATIVELY SLOW AND COSTLY DUE TO CONVENTIONAL EQUIPMENT SPEED LIMITATIONS AND DEPENDENCY ON THE SKILL AND SPEED LEVELS OF THE OPERATOR. WORKING CONDITIONS AROUND DROP HAMMERS ARE HOT, DIRTY AND NOISY.						
SOLUTION - ESTABLISH A HIGH SPEED AUTOMATED FORGING CENTER INCLUDING A PROGRAMABLE FORGING HAMMER, ELECTRIC BILLET-HEATING SYSTEM, PROGRAMABLE ROBOT MATERIAL HANDLING DEVICE, RELATED CONVEYORS AND OPERATION PARAMETERS.						
(8154) TITLE - COMPUTER INTEGRATION MFG (CIM), DDNC	442	650	450			
PROBLEM - NUMERICAL CONTROL MACHINE TOOLS OFFER MANY ADVANTAGES OVER CONVENTIONAL MACHINE TOOLS BUT HAVE CERTAIN DISADVANTAGES. ONE PROBLEM AREA IS GETTING MACHINE INSTRUCTIONS TO THE MACHINE TOOL AND COLLECTING MANAGEMENT INFORMATION.						
SOLUTION - INTERFACE IN-HOUSE COMPUTER FACILITIES WITH CURRENT AND FUTURE NC MACHINE TOOLS TO FORM AN ADVANCED COMPUTER INTEGRATED MFG SYSTEM. UTILIZE DNC TECHNOLOGY.						

COMPONENT -- EQUIPMENT (CONTINUED)	FUNDING ($000) PRIOR	83	84	85	86	87
(8416) TITLE - FLEXIBLE MACHINING SYSTEM-RIA (CAM)	138		399	178		
PROBLEM - FLEXIBLE MACHINING SYSTEM (FMS) TECHNOLOGY OFFERS MANY ADVANTAGES TO PLANTS THAT MANUFACTURE PARTS ON LOW TO MID VOLUME QUANTITIES. HOWEVER, ESTABLISHING FEASIBILITY, PURCHASING, AND IMPLEMENTING FMS IS WIDE IN SCOPE AND VERY COMPLEX.						
SOLUTION - FEASIBILITY WILL BE ESTABLISHED VIA AN FY82 PROJECT. THIS PROJECT WILL PERFORM THE ANALYSES NEEDED TO DEVELOP A REQUEST FOR PROPOSAL (RFP). A RFP WILL BE PREPARED.						
(8424) TITLE - AUTOMATIC/ROBOTIC WELDING OF WEAPON COMPONENTS (CAM)			291			
PROBLEM - THE REPAIR OF DEFECTIVE WELDS ARE FREQUENTLY EXPERIENCED. REPAIR REQUIREMENTS ARE OFTEN TRACED TO THE SKILL LEVEL OF THE WELDING OPERATORS.						
SOLUTION - ADAPTIVE CONTROLS ARE BEING USED IN AN INCREASING NUMBER OF WELDING APPLICATIONS TO DEEMPHASIZE OPERATOR SKILL IN MAKING CONSISTENT PRODUCT. SUCH FEEDBACK CONTROL ROBOTS SHOULD BE USED ALSO IN WEAPONS FABRICATION.						
(8501) TITLE - NON-ROTATION METHODS OF FRICTION WELDING						225
PROBLEM - ROTATIONAL FRICTION WELDING IS CONFINED TO APPLICATIONS IN WHICH AT LEAST ONE OF THE TWO PIECES TO BE JOINED HAS A CIRCULAR OR NEAR-CIRCULAR CROSS SECTION.						
SOLUTION - NON-ROTATION FRICTION WELDERS SUCH AS ORBTAL AND OSCILLATORY TYPES ARE NOW AVAILABLE WHICH OVERCOME RESTRICTIONS ON SHAPE.						
(8532) TITLE - ARMCAM FOR FUTURE CAM ACTIVITIES					120	
PROBLEM - IN CONDUCTING SEPARATE EFFORTS ON CAM, IT CAN BE EXPECTED THAT PURCHASED EQUIPMENT MAY NOT BE FULLY UTILIZED OR SOFTWARE MAY NOT BE COMPATIBLE WITHIN VARIOUS CAM SYSTEMS USED BY DIFFERENT ARMY INSTALLATIONS AND SUPPLIERS.						
SOLUTION - DEVELOP A MASTER PLAN FOR ARMY CAM ACTIVITIES. IT WILL OUTLINE MEDIUM TO LONG-RANGE GOALS FOR FURTHER CAM APPLICATION AND DETERMINE WHAT MFG AREAS REQUIRE MORE EMPHASIS.						
(3608) TITLE - STATE-OF-THE-ART LADLE/FURNACE REFINING					85	
PROBLEM - THERE ARE NO PROVISIONS IN PROJECT 6838251, IMPROVED MELTING PRACTICES, TO IMPLEMENT TECHNIQUES THAT REQUIRE PURCHASE OF MAJOR ITEMS SUCH AS AN ARGON OXYGEN DECARBURIZATION FURNACE.						
SOLUTION - THIS PROJECT WILL BE USED TO INSTALL NEW FURNACE/LADLE EQUIPMENT. THE BEST PROCESS PARAMETERS WILL BE DETERMINED AND CONTROLS WILL BE EVALUATED.						

	FUNDING ($000)					
	PRIOR	83	84	85	86	87
COMPONENT -- EQUIPMENT (CONTINUED)						
(8704) TITLE - ROBOTICS FOR CLEANING CASTINGS						205
PROBLEM - CLEANING THE CASTINGS AND REMOVING THE GATES AND RISERS IS LABOR INTENSIVE AND HOISTS ARE NEEDED TO POSITION THE CASTINGS. THE CASTINGS ARE OFTEN DAMAGED FROM FREQUENT REPOSITIONING. GRINDING OF GATES AND RISERS CREATES A HOSTILE ENVIRONMENT.						
SOLUTION - USE A ROBOTIC SYSTEM FOR CLEANING AND REMOVING THE GATES AND RISERS. THE PRODUCTIVITY WILL IMPROVE, CASTINGS WILL NOT HAVE TO BE REPAIRED OR REJECTED AS FREQUENTLY, AND WORKERS WILL NOT BE EXPOSED TO THE HOSTILE ENVIRONMENT.						
(8707) TITLE - INDUCTION HEATING FOR FORGING/HEAT TREATING						150
PROBLEM - GAS FIRED FURNACES USED FOR FORGING AND ELECTRIC FURNACES USED FOR HEAT TREAT ARE NOT EFFICIENT. A LARGE PORTION OF FURNACE TIME FOR HEAT TREATING AND VIRTUALLY ALL THE FURNACE TIME FOR FORGING IS SPENT HEATING THE PART TO TEMPERATURE.						
SOLUTION - APPLICATIONS THAT WILL BE EXAMINED INCLUDE HEATING BILLETS PRIOR TO FORGING AND DUPLEXING THE HEAT TREATMENT OF SOME WEAPON COMPONENTS BY HEATING UP TO A GIVEN TEMPERATURE WITH INDUCTION AND THEN SWITCHING TO ANOTHER FURNACE.						
(8708) TITLE - NEW FURNACE ATMOSPHERES FOR HEAT TREATING						95
PROBLEM - THE CONTROLLED ATMOSPHERE FURNACES AT ROCK ISLAND ARSENAL HAVE LIMITED CAPACITY AND SMALL MAXIMUM SIZE RESTRICTIONS. ONLY SMALL PARTS CAN BE HEAT TREATED IN THESE FURNACES.						
SOLUTION - INSTALL NEW CONTROLLED ATMOSPHERE FURNACES WITH ATMOSPHERE PRODUCING SYSTEMS THAT CAN ECONOMICALLY HEAT TREAT UNDER A VARIETY OF ATMOSPHERES. SCALE AND DECARBURIZATION WILL BE REDUCED, SO LESS MACHINING IS REQUIRED.						
COMPONENT -- INFORMATION SYSTEMS						
(8132) TITLE - PERFORMANCE MEASUREMENT PARAMETERS FOR GOGO MFG.					100	
PROBLEM - MEASURING THE PERFORMANCE OF A GOVERNMENT MANUFACTURING OPERATION IS DIFFICULT. GOGO OPERATIONS, ALTHOUGH PARTIALLY COMPETITIVE, ARE NOT IN A FULLY COMPETITIVE MARKETPLACE. ACCOUNTING DATA BY ITSELF IS NOT SUFFICENT TO MEASURE PERFORMANCE.						
SOLUTION - DEVELOP A SERIES OF MEASUREMENTS THAT COMBINE ACCOUNTING DATA AND PRODUCTION DATA TO ADEQUATELY ASSESS PERFORMANCE. INCLUDE DATA ON TECHNOLOGICAL IMPROVEMENTS, INFLATION, PRODUCT COST, ETC. MEASUREMENTS WILL BE USEFUL IN LONG RANGE PLANNING.						

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- INFORMATION SYSTEMS (CONTINUED)							
(8305)	TITLE - INTEGRATED MANUFACTURING SYSTEM(ICAM)	439	75	2094	950	1360	1020
	PROBLEM - MI SYSTEMS ARE APPLIED LOCALLY BUT THERE IS NO DATA MANAGEMENT SYSTEM FOR THE ENTIRE MFG ACTIVITY. THIS INCREASES COST DUE TO LONG LEAD TIMES, SCHEDULE INTERRUPTIONS AND SHORTAGES OF MACHINE AVAILABILTY, LABOR AND MATERIAL.						
	SOLUTION - DEVELOP AN MIS WHICH ADDRESSES ACTIVITIES OF ALL DIRECTORATES SUPPORTIVE TO MANUFACTURING AT RIA. THE SYSTEM WILL USE STATE-OF-THE-ART TECHNOLOGY TO DELINIATE OPTIMUM SCHEDULING AND PIN POINT POTENTIAL PROBLEM AREAS FOR EASIER RESOLUTION.						
(8306)	TITLE - ON-LINE PRODUCTION INFORMATION SYSTEM (CAM)	70	200	571			
	PROBLEM - THE MANUFACTURING DATA BASE CANNOT BE ACCESSED THROUGH AN ON-LINE DATA BASE SYSTEM, MAKING INTEGRATION OF AUTOMATED SYSTEMS FOR PROCESS PLANNING,TIME STDS GENERATION, FACILITIES/MOBILIZATION PLANNING AND PRODUCTION CONTROL SIMULATION DIFFICULT.						
	SOLUTION - DEVELOP THE MANUFACTURING DATA BASE FROM ITS PRESENT BATCH ORIENTATED ENVIRONMENT TO AN ON-LINE SYSTEM.						
(8417)	TITLE - FACTORY INFORMATION MANAGEMENT - RIA (CAM)			280			
	PROBLEM - THE EXCHANGE OF INFORMATION WITHIN THE ROCK ISLAND ARSENAL MANUFACTURING ORGANIZATION IS BY HARDCOPY REPORTS. THE GENERATION OF MANUFACTURING MANAGEMENT REPORTS IS LABOR INTENSIVE AND ERROR PRONE.						
	SOLUTION - THE REQUIREMENTS FOR RIA MANUFACTURING MANAGEMENT OF PRODUCTION DATA WILL BE DEFINED AND A PILOT COMPUTER SYSTEM WILL BE PROCURED.						
(8559)	TITLE - CIM FOR CANNON CAD/CAM/COMM				1160	490	515
	PROBLEM - THE EXCHANGE OF MANUFACTURING DATA AT WATERVLIET ARSENAL IS LARGELY MANUAL, ERROR PRONE AND TIME CONSUMING. CURRENT PROCESS PLANNING, SCHEDULING, AND PRODUCTION CONTROL SYSTEMS EXCHANGE DATA MANUALLY.						
	SOLUTION - DETERMINE THE SYSTEM REQUIREMENTS FOR A COMPUTER AIDED DESIGN SYSTEM. DETERMINE THE SYSTEM REQUIREMENTS TO INTEGRATE THE COMPUTER AIDED MANUFACTURING FACILITIES AND BUSINESS SYSTEMS. THE SYSTEM REQUIREMENTS WILL BE ADDRESSING EXISTING AND NEAR TERM.						
COMPONENT -- MISCELLANEOUS							
(7945)	TITLE - HEAT RECOVERY FROM MANUFACTURING PROCESSES					40	130
	PROBLEM - LARGE AMOUNTS OF ENERGY ARE WASTED IN MANUFACTURIN PROCESSES, E.G., HEAT TREATING, FORGING, SURFACE TREATMENT, AND CASTING.						
	SOLUTION - ANALYZE ENERGY CONSUMPTION RELATED TO THESE MANUFACTURING PROCESSES TO DETERMINE AREAS WHERE HEAT CAN BE ECONOMICALLY RECOVERED. DESIGN, INSTALL, AND PROVE OUT HEAT RECOVERY DEVICES WHERE ECONOMICAL.						

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- MISCELLANEOUS (CONTINUED)							
(8464)	TITLE - OPTICAL COATING/MOUNTING PLASTICS F/MILITARY OPTICS					235	
	PROBLEM - LACK OF OPTICAL PERFORMANCE, THERMAL STABILITY, ENVIRONMENTAL RESISTANCE HAS PREVENTED USE OF THESE MATERIALS FOR ARMY APPLICATION. USE OF PLASTICS FOR FIRE CONTROL OPTICAL SYSTEMS OFFERS SIGNIFICANT POTENTIAL FOR COST AND WEIGHT REDUCTIONS.						
	SOLUTION - THIS PROJECT WILL IDENTIFY THE MFG PROCEDURES AND CONTROLS AND THE PLASTIC MATERIALS WHICH MUST BE MODIFIED TO UPGRADE THE MANUFACTURED ITEM TO MILITARY QUALITY. A PILOT PRODUCTION LINE WILL BE ESTABLISHED.						
(8535)	TITLE - DETERMINATION OF AREAS WITHIN MANTECH FOR FUTURE R+D					40	
	PROBLEM - WITH THE ADVENT OF THE NEW ARMY BATTLE PLAN, FIELD CAPABILITY FOR MANUFACTURING REPLACEMENT PARTS AND REPAIRS WILL BE NEEDED. THE ECONOMICS, FUTURE DEVELOPMENTS, SIGNIFICANT PROCESSES AND COMPONENTS REQUIRING NEW TECHNIQUES NEED IDENTIFICATION.						
	SOLUTION - BY COMPILING INFO ON MFG OF MILITARY HARDWARE FROM DOMESTIC AND FOREIGN SOURCES,DETERMINE THOSE ITEMS WHICH ARE DIFFICULT/EXPENSIVE TO MFG AND SUGGEST POSSIBLE PRODUCTION TECHNIQUES FOR CONUS OR BATTLEFIELD USES.						
(8702)	TITLE - ROBOT APPLICATION IN BATCH MFG (CAM)				350		
	PROBLEM - MANUFACTURING OPERATIONS AT ROCK ISLAND ARSENAL ARE LABOR INTENSIVE. MANY OPERATIONS ARE REPETITIVE, TIME CONSUMING, AND ERROR PRONE. SOME OPERATIONS ARE PERFORMED IN A HAZARDOUS ENVIRONMENT OR REQUIRE EXCESSIVE SAFETY AND HEALTH CONTROLS.						
	SOLUTION - INDUSTRIAL ROBOT POTENTIAL APPLICATIONS WILL BE EVALUATED. ROBOT SYSTEMS WILL BE SIMULATED FOR PERFORMING MANUFACTURING OPERATION AT RIA. COST EFFECTIVE APPLICATIONS WILL BE ANALYZED. ONE APPLICATION WILL BE DEMONSTRATED WITH A OPERATIONAL SYSTEM.						
COMPONENT -- PROCESSES							
(8120)	TITLE - ADAPTIVE CONTROL TECHNOLOGY (CAM)	60	495		200		
	PROBLEM - CURRENT GRINDING PROCESSES DO NOT TAKE ADVANTAGE OF THE GRINDING WHEEL CUTTING EFFICIENCY. PRECISION TOLERANCES ARE DIFFICULT TO HOLD DUE TO PART HEATING. WHEEL WEAR RATES INCREASE EXPONENTIALLY WITH FEED RATES AND LIMIT PRODUCTIVITY.						
	SOLUTION - USE A PROCESS CALLED ENERGY ADAPTIVE GRINDING. IT USES AN ADAPTIVE CONTROL, FITTED TO A CYLINDRICAL GRINDER. WHEEL SPEED, WHICH DETERMINES WHEEL SHARPNESS WHICH EFFECTS METAL REMOVAL RATES AND EFFICIENCY, IS CONTROLLED.						
(8206)	TITLE - APPLICATION OF HIGH-RATE ABRASIVE MACHINING					40	105
	PROBLEM - CONVENTIONAL GRINDING IS SLOW AND COSTLY. LONG, MULTIPLE PASSES AND INFEEDS ARE REQUIRED TO SIZE AND FINISH WEAPON COMPONENTS.						
	SOLUTION - APPLY HIGH-SPEED ABRASIVE-BELT MACHINING.						

		FUNDING ($000)				
	PRIOR	83	84	85	86	87
COMPONENT -- PROCESSES (CONTINUED)						
(8225) TITLE - ELECTROCHEMICAL GRINDING OF WEAPON COMPONENTS			138			
PROBLEM - SIZING AND FINISHING OF LARGE, LONG WEAPON COMPONENTS BY CONVENTIONAL GRINDING IS SLOW AND COSTLY, OFTEN REQUIRING MULTIPLE OPERATIONS, SET-UPS, WHEEL CHANGES, AND REPETITIVE MULTIPLE PASSES. FOR EXAMPLE- PLANING/GRINDING HOWITZER MOUNT RAIL.						
SOLUTION - RETROFIT EXISTING, SPECIAL LONG BED, HORIZONTAL, SURFACE GRINDER WITH ELECTROLYTIC SYSTEM TO PROVIDE FAST, SINGLE PASS ROUGH FINISHING OF LARGE COMPONENTS, ELIMINATE ROUGHING BY PLANING OR MILLING BEFORE ELECTROLYTIC GRINDING.						
(8230) TITLE - NON SOLVENT BASED PAINTING PROCESSES						125
PROBLEM - CURRENTLY, SPRAY PAINT BOOTHS ARE USED FOR COATING METALS FOR HIDING POWER AND CORROSION RESISTANCE. THIS METHOD REQUIRES HYDROCARBON SOLVENTS AS A VEHICLE FOR THE PAINT. CONSEQUENTLY, THE SOLVENT IS DISCHARGED TO THE ATMOSPHERE.						
SOLUTION - NEW SPECIFICATIONS MUST BE PREPARED TO SPECIFY THE USE OF NON SOLVENT BASED PAINT. METHODS SUCH AS ELECTROSTATIC PAINTING WILL BE ADAPTED TO ELIMINATE HYDROCARBON SOLVENTS. THIS WILL ALSO REDUCE WATER CONSUMPTION REQUIRED FOR ENTRAPMENT OF SOLVENTS.						
(8231) TITLE - IMPROVED CASTING TECHNOLOGY (CAM)		136	121			
PROBLEM - EXCESSIVE METAL MUST BE MELTED IN CASTING OPERATIONS. THE YIELD RATIO OF SOME CASTS IS TOO LOW AND THE GATES AND RISERS TOO DIFFICULT TO CUT OFF. MATERIAL PROPERTIES OFTEN VARY WITH CASTING PROCEDURES.						
SOLUTION - USING COMPUTERIZED TECHNIQUES AND PRODUCTION CASTING FACILITIES, THE OPTIMUM SHAKE OUT TIMES, RISER SLEEVES AND GATING AND RISERING CONFIGURATIONS WOULD BE DETERMINED. PROPERTIES OF CAST MATERIALS WILL BE EVALUATED FOR DIFFERENT CAST DESIGNS.						
60) TITLE - ESTABLISHMENT OF ZINC ION VAPOR DEPOSITION PROCESS					90	
PROBLEM - REPLACEMENT OF ELECTROPLATING ON WEAPON COMPONENTS IS REQUIRED TO AVOID HYDROGEN EMBRITTLEMENT OF PLATED FERROUS PARTS HAVING A HARDNESS ABOVE ROCKWELL C40 AND TO AVOID THE DISCHARGE OF CYANIDES AND HEAVY METALS IN EFFLUENTS.						
SOLUTION - THE ZINC ION VAPOR DEPOSITION PROCESS PROVIDES A LOW COST, HIGH PERFORMANCE CORROSION PROTECTION TO STEEL AND ALUMINUM ALLOYS. NEITHER THE COATING NOR THE COATING PROCESS PRESENT ECOLOGY PROBLEMS.						

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- PROCESSES (CONTINUED)							
(8402)	TITLE - WARM FORGING OF WEAPON COMPONENTS (CAM)			227	227		
	PROBLEM - EXCESSIVE ENERGY IS CONSUMED IN CONVENTIONAL FORGING. ALSO DIE LIFE IS SHORTENED BY HIGH FORGING TEMPERATURES AND BY OXIDATION.						
	SOLUTION - BY USING CAD/CAM TECHNIQUES FOR DIE DESIGN, FORGING WILL BE DONE AT MUCH LOWER TEMPERATURE AND THE FINAL PARTS WILL HAVE BETTER MECHANICAL PROPERTIES						
(8403)	TITLE - DESIGN CRITERIA FOR HARDENING (CAM)			261		110	
	PROBLEM - SELECTION OF THE BEST HARDENING PROCESS. INCOMPLETE HARDENING THROUGHOUT THE COMPONENT AND COMPLICATIONS CAUSED DURING THE HEAT TREATMENT OF WELDMENTS ARE RECURRING PROBLEMS CURRENTLY ADDRESSED BY EMPIRICAL METHODS.						
	SOLUTION - THE RELATIONSHIPS OF DIFFERENT VARIABLES SUCH AS QUENCH RATES, COMPONENT SIZE, SHAPE, AND COMPOSITION WILL BE ESTABLISHED. A COMPUTER WILL BE PROGRAMMED TO FURNISH THE NECESSARY INFORMATION						
(8406)	TITLE - AUSTENITIZING AND HOMOGENIZING PROCEDURES FOR ARMOR CASTINGS			136			
	PROBLEM - ARMOR CASTINGS HAVE TO PASS IMPACT REQUIREMENTS WHICH DEPEND UPON THE HARDNESS. SOME OF THE HEATS FAILED TO MEET THESE STRIGENT REQUIREMENTS.						
	SOLUTION - DEPENDING UPON MNS DISTRIBUTION, HIGHER TEMPERATURE AUSTENITIZING TREATMENTS RESULTED IN THIS TEMPERATURE RANGE WILL BE EVALUATED AND THE EFFICACY OF NORMALIZING AND HOMOGENIZING TREATMENTS FOR THE CAST ARMOR WILL BE DETERMINED.						
(8502)	TITLE - ION IMPLANTATION OF WEAR SURFACES						65
	PROBLEM - IT CAN BE DIFFICULT TO PRODUCE A FINISHED WEAR SURFACE WHICH IS BOTH HARD AND DIMENSIONAL. PRECISE CHROMIUM PLATING IS GENERALLY USED TO SOLVE THIS PROBLEM, BUT IT HAS LIMITATIONS WHEN THICK COATINGS ARE REQUIRED.						
	SOLUTION - TREAT FINISHED WEAR SURFACES BY ION IMPLANTATION OF DESIRABLE ELEMENTS TO IMPART CORROSION RESISTANCE, WEAR RESISTANCE AND FAVORABLE RESIDUAL STRESS WITHOUT DISTORTION.						
(8503)	TITLE - ELECTRO-MECHANICAL JOINING TECHNIQUES					90	50
	PROBLEM - PURELY MECHANICAL (FRICTION WELDING) OR MOSTLY ELECTRICAL (RESISTANCE) WELDING MACHINES OF VARIOUS TYPES WOULD HAVE TO BE LARGE AND WOULD TAKE EXCESSIVE TIME TO WELD JOINT AREAS 25 SQUARE INCHES OR MORE.						
	SOLUTION - COMBINE THE FEATURES OF BOTH METHODS TO DELIVER SUFFICIENTLY LARGE SPECIFIC ENERGY FOR WELDING OF LARGE PARTS						

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- PROCESSES (CONTINUED)							
(8506)	TITLE - ADVANCED MACHINING METHODS FOR COST DRIVER PARTS					140	
	PROBLEM - MOST PROJECTS TO IMPROVE MANUFACTURING METHODS ATTACK THE PROBLEM FROM A SPECIFIC PROCESS OR FUNCTION. NO PRESENT RIA PROJECTS ATTACK THE PROBLEM OF REDUCING MACHINING COSTS BY IDENTIFYING WHICH CONTRIBUTE MOST TO COSTS.						
	SOLUTION - IDENTIFY THOSE PARTS MANUFACTURED AT ROCK ISLAND ARSENAL WHICH CONTRIBUTE MOST TO MANUFACTURING COSTS. ANALYZE THESE COST DRIVER PARTS TO IDENTIFY AREAS WHERE MANUFACTURING COSTS CAN BE REDUCED.						
(8509)	TITLE - COMPUTERIZED FOUNDRY MELT COMPOSITION CONTROL (CAM)				77	140	
	PROBLEM - PRESENT METHODS FOR DETERMINING THE MELT CHARGE ARE INEFFICIENT + INCREASE MELT TIME CONSUME EXCESS ELECTRICITY AND ELECTRODES THEREBY INCREASING COSTS.						
	SOLUTION - INSTALL COMPUTER CONTROLS TO MONITOR THE MELT AND ELECTRIC POWER AND ELECTRODE THE RESULT WILL BE MORE ACCURATE COMPOSITIONS AND POUR TEMPERATURES THE RESULT WILL BE LOWER COST CHARGES + LESS ENERGY AND ELECTRODE CONSUMPTION.						
(8512)	TITLE - ADVANCED COMPUTER AIDED PROCESS PLANNING (CAM)					70	130
	PROBLEM - BY 1985, RIA PLANS TO HAVE AN INITIAL, INTERACTIVE, ON-LINE COMPUTER AIDED PROCESS PLANNING SYSTEM. MUCH MORE BENEFIT CAN BE DERIVED FROM IT BY EXTENDING ITS CAPABILITIES TOWARD A GENERATIVE PROCESS PLANNING CAPABILITY.						
	SOLUTION - EXTEND CAPABILITY TO INCLUDE THE USE OF COMPUTER GRAPHICS, GENERATIVE CAPABILITIES FOR TURNED PARTS, AND COMPUTER ASSISTS TO STANDARDIZE PROCESS PLANS ON THE BEST PLAN FOR PARTICULAR PART FAMILIES						
(8513)	TITLE - MICROWAVE CURING OF FURAN BONDED SAND					95	
	PROBLEM - CURE RATE OF FURAN BOND SANDS DEPENDS ON THE ACID CATALYST/RESIN RATIO AND THE SIZE AND TEMP OF THE MOLD. SINCE PDN RATES ARE HIGH, SOME RATIOS CANNOT BE USED WHILE USEABLE RATIOS ARE A COMPROMISE BETWEEN VALUES FOR LARGE AND SMALL MOLDS.						
	SOLUTION - USE MICROWAVE HEATING TO CHANGE THE CURE CHARACTERISTICS OF SELECTED RESIN-CATALYST SYSTEMS TO COMPENSATE FOR DIFFERENT SIZES OF MOLDS. THIS WILL PERMIT A MORE UNIFORM PRODUCTION RATE.						
(8514)	TITLE - OPTIMIZATION OF MACHINING PARAMETERS					80	80
	PROBLEM - CONTROL OF TIME, COST AND QUALITY DEPENDS ON EMPIRICAL ADJUSTMENTS TO THE PDN EQUIPMENT. APPLICATION OF FULLY AUTOMATED CONTROLS HAS BEEN DELAYED BY NONAVAILABILITY OF STATE-OF-THE-ART EQUIPMENT.						
	SOLUTION - APPLY AVAILABLE COMPUTERS TO ANALYZE AND QUANTIFY THE EFFECTS OF BASIC OPERATION VARIABLES ON THE COST AND QUALITY OF THE WORKPIECE. DEVELOP SOFTWARE TO DETERMINE THE OPTIMUM OPERATION VARIABLES TO BE INCLUDED ON THE SHOP ORDER.						

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- PROCESSES (CONTINUED)							
(8515)	TITLE - APPLICATION OF WIDE AREA PLUNGE GRINDING					40	105
	PROBLEM - CONVENTIONAL MACHINING OF WORKPIECES WITH MULTIPLE DIAMETERS AND BLENDED TAPERS AND RADII REQUIRES MANY OPERATIONS AND IS SLOW AND COSTLY.						
	SOLUTION - USE A WIDE GRINDING WHEEL WHOSE FACE IS DRESSED TO THE REQUIRED PROFILE AND PRODUCE THE FINISHED PIECE IN ONE OPERATION BY PLUNGE GRINDING TO SIZE.						
(8522)	TITLE - LASER SURFACE ALLOYING PROCESS FOR IMPROVED WEAR RESISTANCE					115	170
	PROBLEM - COMPONENT PARTS OF WEAPON SYSTEMS SUBJECTED TO EXTENDED OPERATIONS ARE EXPERIENCING EXCESSIVE WEAR THAT JEOPARDIZES THE DRIVE TOWARD HIGH PERFORMANCE CAPABILITY.						
	SOLUTION - MARGINALLY WEAR RESISTANCE COMPONENT PARTS CAN BE SUBSTANTIALLY UPGRADED BY LASER SURFACE ALLOYING WITH HARDFACING MATERIAL DESIGNED TO IMPROVE ITS WEAR RESISTANCE.						
(8523)	TITLE - ION IMPLANTATION OF WEAPON COMPONENTS					145	245
	PROBLEM - COMPONENT PARTS OF WEAPON SYSTEMS SUBJECTED TO EXTENDED OPERATIONS ARE EXPERIENCING EXCESSIVE WEAR THAT JEOPARDIZES THE DRIVE TOWARD HIGH PERFORMANCE CAPABILITY.						
	SOLUTION - MARGINALLY WEAR RESISTANCE COMPONENT PARTS CAN BE SUBSTANTIALLY UPGRADED BY ION IMPLANTING ELEMENTAL SPECIES DESIGNED TO IMPROVE ITS WEAR RESISTANCE.						
(8534)	TITLE - CONSERVATION OF ENERGY IN PROCESSING OF WEAPONS COMPONENTS					105	140
	PROBLEM - PRESENT HEAT TREAT TECHNIQUE AND SELECTION OF HEAT TREAT EQUIPMENT RELIES ON PAST EXPERIENCE AND IS NOT BASED ON SCIENTIFIC CALCULATIONS.						
	SOLUTION - EVAL PRESENT TECHNIQUES AND EQUIPMENT. DEVELOP COMPUTER-AIDED-MODULAR METHOD TO PREDICT MIN TIME REQD TO HEAT A PART. DEVELOP MODELS TO COMPARE COSTS TO HEAT A GIVEN PART BY VARIOUS MEANS (GAS, INDUCTION, RESISTANCE, ETC).						
(8602)	TITLE - LASER SURFACE HARDENING					50	430
	PROBLEM - CURRENTLY AT RIA THE ENTIRE COMPONENT IS HEAT TREATED. THIS CAN CAUSE DISTORTION AND DISTURBED SURFACES, AND CAN ELIMINATE THE BENEFITS OF SELF QUENCHING AND CONTROLLED PENETRATION.						
	SOLUTION - LASER HEAT TREATING PERMITS THE TREATMENT OF SELECTED AREAS. FINE PRECISION AND RAPID PRODUCTION CAN BE OBTAINED WITHOUT DISTORTION OR SURFACE SCALE.						

		FUNDING ($000)				
	PRIOR	83	84	85	86	87
-- PROCESSES (CONTINUED)						
(8603) TITLE - ROBOTIC WELDING				285	345	
PROBLEM - PRODUCTIVITY IN THE WELD SHOP IS LIMITED BECAUSE THE MAJORITY OF THE WELDING IS DONE MANUALLY.						
SOLUTION - MULTIPLE AXIS ROBOTIC WELDERS INTEGRATED WITH MULTIPLE AXIS PART HANDLING SYSTEMS, PALLETIZING, PREHEAT FURNACES, STRESS RELIEVING OVENS, AND FIXTURING CAN REDUCE COSTS WHILE IMPROVING RATES.						
(8604) TITLE - MACHINEABILITY DATA BASE					155	
PROBLEM - THE COMPUTERIZED FACTORY COMMUNICATION SYSTEMS THAT WILL BE IN PLACE AT RIA BY 1986 WILL REQUIRE SIGNIFICANT DEVELOPMENT AND IMPLEMENTATION EFFORT.						
SOLUTION - ESTABLISH A MACHINABILITY DATA BASE AND CONTROL SYSTEM THAT USES THE COMMUNICATION SYSTEM; A DATA BASE OF MACHINING SPEED, FEED, AND TOOLING DATA; AND APPLICATION COMPUTER PROGRAMS TO IMPROVE MACHINING OPERATIONS.						
(8605) TITLE - RING ROLLING OF WEAPON COMPONENTS					70	
PROBLEM - COMPONENTS WITH RING LIKE SHAPE OFTEN REQUIRE EXTENSIVE METAL REMOVAL OVER ALMOST THE ENTIRE SURFACE BECAUSE TUBING OF THE OPTIMUM SIZE FOR RAW MATERIAL IS NOT AVAILABLE. THIS INCREASES PRODUCTION COSTS.						
SOLUTION - SIMPLE SHAPED RINGS WITH LITTLE EXCESS MATERIAL WILL BE SHAPED ON SPECIAL RING ROLLING EQUIPMENT TO NEAR NET SHAPE.						
(8606) TITLE - IMPROVED CARBURIZING TECHNOLOGY					70	
PROBLEM - CARBURIZING IS NOW DONE IN CYANIDE SALTS WHICH PRESENT SAFETY AND DISPOSAL PROBLEMS. THE PROCESS REQUIRES CLOSE ATTENTION BY THE HEAT TREATERS TO MEET QUALITY AND SAFETY REQUIREMENTS.						
SOLUTION - USE A FLUIDIZED BED FURNACE WHICH CAN BE APPLIED TO CARBURIZING, ANNEALING IN NEUTRAL ATMOSPHERE, OR GENERAL HEAT TREAT IN AIR.						
(8609) TITLE - HIP-ING OF LARGE POWDERED METAL COMPONENTS					60	80
PROBLEM - THE RECOIL MECHANISMS MANUFACTURED AT RIA CONTAIN MANY FORGINGS + CASTINGS WITH RING LIKE SHAPES. EITHER PROCESS REQUIRES EXTENSIVE METAL REMOVAL. FREQUENTLY, THE FORGINGS CRACK DURING QUENCHING BECAUSE OF PROBLEMS ASSOCIATED WITH DIRTY STEEL.						
SOLUTION - THESE COMPONENTS WILL BE MADE FROM POWDERED METALS AND WILL BE HOT ISOSTATIC PRESSED TO GIVE THEM PROPERTIES SIMILAR TO THE CASTINGS. COMPONENTS WILL NOT CONTAIN DIRT STRINGERS AND WILL BE CLOSER TO THE FINISHED SHAPE, SO MACHINING WILL BE REDUCED.						

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- PROCESSES (CONTINUED)							
(8610)	TITLE - PREPARATION OF COUPONS REPRESENTATIVE OF CASTINGS					75	70
	PROBLEM - MANY SPECS REQUEST THE DESTRUCTIVE TEST OF A SEPARATELY PREPARED COUPON RATHER THAN THE ACTUAL PART. THE MECHANICAL PROPERTIES OF THE MATERIAL IN THE COUPON FREQUENTLY DIFFER FROM THOSE IN THE CASTINGS.						
	SOLUTION - THIS PROGRAM WILL ESTABLISH PROCEDURES FOR DESIGNING AND HEAT TREATING COUPONS THAT ACCURATELY REPRESENT ACTUAL PARTS.						
(8611)	TITLE - AUTOMATED ANALYSIS AND CONTROL OF PLATING BATHS					55	150
	PROBLEM - PERIODIC WET CHEMISTRY ANALYSIS OF PLATING BATHS IS REQD TO MAINTAIN PROPER CHEMICAL BALANCE. THE TIME LAG BETWEEN ANALYSIS AND USE IS A DETRIMENTAL FACTOR.						
	SOLUTION - APPLY AUTOMATED ANALYTICAL EQUIPMENT FOR THE CONTINUOUS MONITORING OF BATH COMPOSITIONS AND FOR THE AUTOMATIC ADDITION OF THE REQD INGREDIENTS. THIS EQUIPMENT WILL IDENTIFY IMPURITIES IN THE BATH AND ALSO CHECK WASTEWATER.						
(8613)	TITLE - POWDERED METALS FOR NONFERROUS COMPONENTS					45	60
	PROBLEM - ROCK ISLAND ARSENAL MUST CAST SMALL PARTS FROM AL OR CU ALLOYS THAT ARE NOT VERY CASTABLE. SHRINKAGE, HOT TEARING AND OXIDES CAUSE UNSOUND CASTINGS WITH ATTENDANT LOW ACCEPTANCE RATES.						
	SOLUTION - IMPROVE ACCEPTANCE BY MAKING THE PROBLEM COMPONENTS FROM POWDERED METAL. COMPARE PROPERTIES OF PM PARTS WITH CAST PARTS. DETERMINE IF ADDITIONAL PROCESSING SUCH AS HIP IS NEEDED AND PERFORM AN ECONOMIC COMPARISON.						
(8626)	TITLE - INCREASED DEPLSITION RATES FOR HARD CHROME PLATING					75	
	PROBLEM - DEPOSITION RATES FOR HARD CHROME ARE PRESENTLY VERY SLOW BEING APPROXIMATELY 0.5 TO 0.7 MIL/HOUR AT ROCK ISLAND ARSENAL. FURTHER, THIS MUST BE PERFORMED AT AN ELEVATED TEMPERATURE WHICH MAKES IT AN ENERGY CONSUMING OPERATION.						
	SOLUTION - CHROME PLATING PROCESSES HAVING HIGH DEPOSITION RATES AT ROOM TEMPERATURE WILL BE EVALUATED. THE UTILIZATION OF THIS PROCESS COULD SIGNIFICANTLY REDUCE THE SIZE OF THE CHROME PLATING OPERATION IN THE NEW REARM PLATING SHOP.						
(8627)	TITLE - ELECTROCHEMICAL MACHINING OF METERING GROOVES					75	
	PROBLEM - VARIABLE DEPTH GROOVES FOR METERING THE FLOW OF HYDRAULIC FLUID ARE CURRENTLY BROACHED WITH SPECIAL EQUIPMENT AND IT IS VERY DIFFICULT TO MEET THE DESIRED SIZE AND FINISH REQUIREMENTS. THE REJECTION RATE HAS HISTORICALLY BEEN HIGH.						
	SOLUTION - A SUCCESSFUL ELECTROCHEMICAL MACHINING PROCESS WOULD REDUCE MACHINING TIME AND IMPROVE SIZE CONTROL, THE SURFACE FINISH IN THE GROOVES, AND THE OVERALL QUALITY OF THE FINISHED COMPONENT.						

		FUNDING ($000)				
		PRIOR	83	84	85	86	87
COMPONENT -- PROCESSES (CONTINUED)							
(8671)	TITLE - INCLUSION CONTROL TECHNOLOGY APPLIED TO RAPID FIRE WEAPONS					150	170
	PROBLEM - THE USABLE LIFE OF AUTOMATIC WEAPONS BETWEEN DEPOT REBUILDS IS PRIMARILY DEPENDENT UPON CRACK PROPAGATION RESULTING FROM CYCLIC LOADING. IN ORDER TO EXTEND THIS LIFE IT IS NECESSARY TO INCREASE THE FATIGUE RESISTANCE OF THE STEEL.						
	SOLUTION - POTENTIAL FOR SIGNIFICANTLY IMPROVED LIFE OF RAPID FIRE WEAPONS IS PROVIDED THROUGH APPLICATION OF STATE-OF-THE-ART TECHNOLOGY IN INCLUSION CONTROL.						
(8705)	TITLE - LASER REMOVAL OF GATES AND RISERS FROM CASTINGS						440
	PROBLEM - ALTHOUGH GAS OPERATED TORCHES REMOVE GATES AND RISERS QUICKLY, THEY CREATE A HEAT AFFECTED ZONE THAT IS HARD TO CONTROL. THE CASTINGS MUST BE REPOSITIONED. IF SAWS ARE USED, REMOVAL OF THE GATES AND RISERS TAKES TOO MUCH TIME.						
	SOLUTION - USE LASERS TO CUT OFF GATES AND RISERS OF AN APPROPRIATE SIZE. REPOSITIONING OF THE WORKPIECE CAN BE REDUCED, PARTICULARLY IF ROBOTICS ARE USED. BECAUSE THE LASER HEAT IS ACCURATELY DIRECTED, THE CASTING WILL NOT HAVE TO BE SCRAPPED OR REPAIRED.						
(8706)	TITLE - INVESTMENT CASTING OF LARGE WEAPON COMPONENTS						105
	PROBLEM - CONVENTIONAL CASTING RESULTS IN LOW YIELD. THE PARTS USUALLY HAVE LARGE RISERS AND EXTENSIVE GATES THAT CONSUME METAL. MACHINED SURFACES REQUIRE EXTENSIVE MACHINING. THE INACCURATE TOLERANCES ON NONMACHINED SURFACES CONTRIBUTE NEEDLESS WEIGHT.						
	SOLUTION - INVESTMENT CASTING WILL BE USED FOR LARGER AND MORE COMPLEX PARTS. THIS PROCESS WILL INCREASE THE YIELD, SAVE MONEY BY ELIMINATING WORK FOR REMOVING GATES AND RISERS, REDUCE MACHINING, AND REDUCE THE WEIGHT OF SOME COMPONENTS.						
(8709)	TITLE - NEAR NET SHAPE MOLDING						140
	PROBLEM - CASTINGS ARE NORMALLY POURED IN LARGE SAND MOLDS WHICH EXPAND AND SHIFT AS THEY ARE HEATED BY THE MOLTEN METAL. THE PROCESS YIELDS A CASTING LARGER THAN NECESSARY. EXCESS MACHINING HAS TO TAKE PLACE.						
	SOLUTION - USING THE SHELL MOLDING PROCESS, THE MOLTEN METAL IS POURED INTO THIN SHELLS OF BONDED SAND. THESE SHELLS ARE RIGID SO THAT THE FINAL CASTING IS CLOSER IN DIMENSIONS TO THE DRAWING. MACHINING AND WEIGHT ARE REDUCED.						

	FUNDING ($000)					
	PRIOR	83	84	85	86	87
COMPONENT -- PROCESSES (CONTINUED)						
(8710) TITLE - AUTOMATED CONTROL OF CUTTING FLUID CONCENTRATION LEVEL						200
PROBLEM - THE EFFECTIVENESS OF ANY CUTTING FLUID IN A PARTICULAR MACHINING OPERATION IS DEPENDENT ON MAINTAINING THE PROPER CONCENTRATION LEVEL DURING THE TIME THE FLUID IS IN THE MACHINE. AT THE PRESENT TIME, VARIATIONS ARE QUITE COMMON.						
SOLUTION - A SINGLE MACHINE, OPERATING FROM ITS OWN SUMP, OR A SERIES OF MACHINES OPERATING FROM A CENTRAL CUTTING FLUID SYSTEM, WILL BE MONITORED SO THAT THE CONCENTRATION LEVEL CAN BE READILY CONTROLLED ON A CONTINUOUS BASIS.						
(8712) TITLE - DISPOSITION OF SPENT CHROMIC ACID PLATING SOLUTION						100
PROBLEM - THE DISPOSITION OF SPENT CHROMIC ACID PLATING SOLUTION IS DIFFICULT BECAUSE OF POLLUTION CONTROL RESTRICTIONS ON HAZARDOUS WASTES. IT IS ALSO EXPENSIVE IF PERFORMED IN-HOUSE SINCE THE COST OF DESTRUCTING CHROME IS 3 TIMES THE PURCHASE PRICE.						
SOLUTION - THE APPLICATION OF MODERN CHROMIC ACID RECOVERY OR REPROCESSING TECHNIQUES COULD RESULT IN A REDUCTION IN BOTH THE AMOUNT OF CHROMIC ACID PURCHASED AND DESTROYED.						
(8713) TITLE - INDUCTION HARDENING BY THE SCANNING PROCESS						75
PROBLEM - THE CURRENT INDUCTION HARDENING PROCESS DOES NOT PRODUCE UNIFORM CASE DEPTHS NOR DOES IT ACHIEVE UNIFORM CONFIGURATION CONTROL OF LUNETTES FOR THE M101A1, M198 AND M102 WEAPON SYSTEMS. THE QUALITY OF THE PROCESS IS SUSPECT.						
SOLUTION - IT IS BELIEVED THAT USE OF A SCANNING TYPE OF INDUCTOR WILL PRODUCE A MORE UNIFORM CASE DEPTH AND BETTER CONFIGURATION CONTROL. THIS WILL IMPROVE THE RELIABILITY AND QUALITY OF THE PRODUCT.						
COMPONENT -- TOOLING						
(8307) TITLE - CRYOGENIC TREATMENT OF TOOL STEELS					50	
PROBLEM - MANY METAL CUTTING OPERATIONS REQUIRE TOOL STEEL CUTTERS OF FORMING TOOLS RATHER THAN CARBIDE OR CERAMIC MATERIALS. TOOL STEEL MATERIALS DO NOT HAVE AS LONG A USEFUL LIFE AS DO THE HARDER MATERIALS AND REQUIRE FREQUENT RESHARPENING.						
SOLUTION - CRYOGENTIC TREATMENT OF TOOL STEELS GREATLY IMPROVES THE WEAR CHARACTERISTICS OF THE TOOL AND GREATLY REDUCES THE FREQUENCY OF RESHARPENING.						

CATEGORY
LARGE CALIBER

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT	-- BREECH MECHANISMS						
(8102)	TITLE - APPLIC. OF POWDER METALLURGY FORGINGS TO COMP.	110	142				
	PROBLEM - FORGINGS AND CASTINGS ARE FABRICATED OVERSIZE AND SUBSEQUENTLY MACHINED DOWN TO FINAL DIMENSIONS. FINAL COMPONENT CONFIGURATION INVOLVES A LARGE AMOUNT OF MANPOWER AND MACHINES TO REMOVE ALLOY STEEL AS CHIPS.						
	SOLUTION - RECENT ADVANCES HAVE OCCURRED IN POWDER METALLURGY FORGING. THE ADVANCES WILL PRODUCE 'NEAR NET SHAPE' COMPONENTS WHICH REDUCES AMOUNT OF MACHINING REQUIRED WHILE KEEPING ADEQUATE MECHANICAL PROPERTIES. UTILIZE NEW TECHNIQUE.						
(8339)	TITLE - APPLIC OF NON-TRADITIONAL SURF. HARDENING METHODS					150	
	PROBLEM - PRESENT METHODS OF SURFACE HARDENING WEAPON COMPONENTS ARE COSTLY, TIME CONSUMING, AND MAY IMPART UNDESIREABLE RESIDUAL STRESSES.						
	SOLUTION - TO TRANSFORM THE SURFACE LAYER OF THE STEEL TO ALLOW MATERIAL TO BE UNIFORMALY QUENCHED. THE ADVANTAGES ARE LESS ENERGY USAGE, POLLUTION FREE, ALLOW HIGHER PRODUCTION RATES, AND MINIMAL POST-PROCESSING SUCH AS CLEANING AND STRAIGHTENING.						
(8440)	TITLE - CONTROLLED GRAIN SIZE CASTINGS, PRODUCTION AND HEAT TREAT					335	
	PROBLEM - FINE GRAIN CASTINGS HAVE DEMONSTRATED AN IMPROVEMENT IN LOW CYCLE FATIGUE LIFE BY A FACTOR OF TWO TO FOUR, IT IS EXPECTED THAT A HEAT TREATMENT WILL EXTEND THE LIFE STILL FURTHER.						
	SOLUTION - PROVIDE FOR CASTING A BREECH BLOCK BY ONE OF THE AVAILABLE TECHNIQUES THEN OPTIMIZE THE HEAT TREATMENT FOR THE CHOSEN ALLOY. LIFE IMPROVEMENTS WILL BE DEMONSTRATED.						
(8441)	TITLE - IMPROVED MANUFACTURE OF PRIMER CHAMBERS			80		170	
	PROBLEM - PRIMER CHAMBERS ARE SMALL COMPLEX CYLINDRICAL FORMS THAT ARE REAMED TO EXACT SIZE AND LOCATION ON BREECH RING SPINDLE SHAFTS. THIS TECHNIQUE IS LABOR AND TOOL INTENSIVE AND OFTEN PRODUCES COMPONENTS THAT REQUIRE SECONDARY FINISHING OPERATIONS.						
	SOLUTION - INVESTIGATE VARIOUS TRADITIONAL AND NONTRADITIONAL MACHINING METHODS, INCLUDING CNC MULTI-TOOLED EDM SYSTEMS. THE RESULTS OF THIS EVALUATION WILL THEN BE USED TO ESTABLISH PRODUCTION EQUIPMENT.						
(8543)	TITLE - SLIDE TABLE CLIMB CREEP FEED GRINDING				78		780
	PROBLEM - MACHINING OF BREECH BLOCKS REQUIRE ROUGHING AND FINISHING OPERATIONS UTILZING HIGH SPEED STEEL CUTTERS, THE ROUGHING OPERATIONS BEING DONE ON CONVENTIONAL EQUIPMENT.						
	SOLUTION - PRODUCE PROTOTYPE EQUIPMENT TO REDUCE THE COST OF MACHINING BREECH BLOCKS THROUGH THE APPLICATION OF CLIMB CREEP FEED GRINDING.						

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- GENERAL							
(7724)	TITLE - GROUP TECHNOLOGY OF WEAPON SYSTEMS	263	250				
	PROBLEM - A PROLIFERATION OF DESIGNS AND PARTS EXIST FOR THE PRODUCTION OF CANNON. UNIQUE MANUFACTURING ROUTINGS ARE GENERATED FOR EACH COMPONENT AND CUSTOM TOOLING AND FIXTURING IS REQUIRED.						
	SOLUTION - THE ARMY HAS PURCHASED A GROUP CLASSIFICATION AND CODING SOFTWARE PACKAGE. ONCE THIS SYSTEM IS IMPLEMENTED, IT SHOULD BE POSSIBLE TO REDUCE THE NUMBER OF DIFFERENT PARTS THRU STANDARDIZATION.						
(8249)	TITLE - SHORT-CYCLE HEAT TREATING OF WEAPON COMPONENTS			132	165		
	PROBLEM - HEAT TREATING SOAK TIMES ARE DETERMINED WITHOUT CONSIDERATION OF THE RELATIONSHIPS BETWEEN COMPOSITION, CONFIGURATION, THICKNESS, AND DETRIMENTAL EFFECTS OF AUSTENITIC GRAIN GROWTH. CONSEQUENTLY, CONSIDERABLE ENERGY IS WASTED.						
	SOLUTION - SUITABLE SYSTEMATIC PRODUCTION METHODS WILL BE USED TO DETERMINE THE PROPERTIES OBTAINED AT MINIMAL PROCESSING TIMES TO REDUCE ENERGY CONSUMPTION AND INCREASE PRODUCTION EFFICIENCY.						
(8323)	TITLE - SPRAY-AND-FUSE PROCESSING OF ARMAMENT COMPONENTS			215	181		
	PROBLEM - MISMATCHED AND WORN WEAPON COMPONENTS ARE NOT ONLY COSTLY TO REPLACE BUT SHORTAGE OF STRATEGIC MATERIALS IMPACT ON THE SUPPLY AND FABRICATION OF NEW COMPONENTS.						
	SOLUTION - UTILIZE THE THERMAL SPRAY AND FUSE COATING PROCESS TO SALVAGE OR RECLAIM OVERSIZED OR WORN WEAPON COMPONENTS (E.G., M140 RECOIL PISTONS).						
(8326)	TITLE - APPLICATION OF CORROSION RESISTANT GALVANIC COATINGS			200	201		
	PROBLEM - CURRENT METAL FINISHES DO NOT PROVIDE ADEQUATE CORROSION AND HEAT RESISTANCE. COMPONENTS ARE REPLACED OR REWORKED BEFORE THEIR INTENDED LIFE. FREQUENT MAINTENANCE IN THE FIELD AND DEPOTS ADD TO THE OVERALL COST OF THE COMPONENTS.						
	SOLUTION - A NEW PROCESS HAS EMERGED FOR APPLYING SUPERIOR CORROSION AND HEAT RESISTANT COATINGS. THE PROCESS, USING SERMIL-16, CONSISTS OF AN AUTOMATED SPRAY-BAKE PROCESS FOR A COATING OF ALUMINUM/CERAMIC AND INORGANIC COATINGS.						
(8426)	TITLE - APPLICATION OF LASERS TO CANNON MANUFACTURE			750			
	PROBLEM - COMPONENT MARKINGS, TOOL MAINTENANCE, COMPONENT SURFACE HARDENING, CUTOFF OF INVESTMENT CAST COMPONENTS, WELDING AND BRAZING ARE DIFFICULT, COSTLY, TIME CONSUMING MANUFACTURING OPERATIONS.						
	SOLUTION - APPLY LASER TO THESE TRADITIONAL MANUFACTURING OPERATIONS TO TAKE ADVANTAGE OF THIS RAPIDLY EMERGING TECHNOLOGY.						

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- GENERAL (CONTINUED)							
(8435)	TITLE - SQUEEZE CASTING OF CANNON COMPONENTS					220	
	PROBLEM - PRESENT PROCESSES, SUCH AS HOT FORGING AND SAND CASTING REQUIRE CONSIDERABLE MACHING WITH ATTENDANT HIGH COSTS AND LOSS OF CRITICAL ALLOYS.						
	SOLUTION - INVESTIGATE THE APPLICATION OF SQUEEZE CASTING AS A CLOSE TO NET SHAPE TECHNOLOGY FOR MANUFACTURING BOTH MAJOR AND MINOR CANNON COMPONENTS.						
(8437)	TITLE - DENSIFICATION OF WEAPON CASTINGS (HIP)			195			
	PROBLEM - CASTINGS FOR WEAPONS COMPONENTS OFTEN CONTAIN EXCESSIVE SHRINKAGE CAVITIES AND VOIDS, RESULTING IN REJECTION OR COSTLY WELD REPAIR.						
	SOLUTION - INTERNAL VOIDS CAN BE MADE SMALLER OR ELIMINATED BY HOT ISOSTATIC PRESSING (HIP), THEREBY IMPROVING TOUGHNESS AND DUCTILITY.						
(8444)	TITLE - MACHINING INTERNAL SURFACES OF MUZZLE BRAKES					135	
	PROBLEM - MACHINING OF THREADS AND INTERNAL SURFACES ON MUZZLE BRAKE FORGINGS IS PRESENTLY ACCOMPLISHED ON FOUR SEPARATE MACHINES. THIS METHOD IS TIME CONSUMING AND PRONE TO ALIGNMENT ERROR.						
	SOLUTION - UTILIZE NEWLY DEVELOPED MATERIAL HANDLING TECHNIQUES AND MACHINE CONTROL DEVICES THAT WILL PERMIT MACHINING OF THREADS AND INTERNAL SURFACES IN A SINGLE SET UP.						
(8542)	TITLE - DIAMOND APPLICATION IN CANNON MFG					50	60
	PROBLEM - VARIOUS LARGE CALIBER COMPONENTS HAVE FINE SURFACE FINISH REQUIREMENTS, NECESSITATING SEMI-FINISH MACHINING FOLLOWED BY FINAL GRINDING.						
	SOLUTION - UTILIZE DIAMOND BURNISHING IN THE SEMI-FINISH OPERATION, THEREBY ACHIEVING THE SPECIFIED SURFACE FINISH WHILE AT THE SAME TIME ELIMINATING THE NEED FOR A FINISH GRINDING OPERATION.						
(8546)	TITLE - MACHINERY CONDITIONS SURVEILLANCE SYSTEM				350		
	PROBLEM - PROVISION DOES NOT PRESENTLY EXIST FOR CONTINUOUS LARGE-SCALE MONITORING OF MACHINE TOOL DYNAMICS IN ORDER TO DETECT CONDITIONS WHICH ARE LIKELY TO RESULT IN MECHANICAL MALFUNCTION.						
	SOLUTION - INTRODUCE A DYNAMIC ON-LINE SYSTEM FOR MONITORING MACHINE TOOL VIBRATIONS AND OTHER OPERATING PARAMETERS. TRANSDUCERS WILL BE PERMANENTLY INSTALLED ON SELECTED MACHINES AND DATA TRANSFERRED TO A CENTRAL SYSTEM FOR ANALYSIS.						

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- GUN MOUNTS							
(8251)	TITLE - IMPROVED MELTING AND POURING TECHNOLOGY	193	164				
	PROBLEM - THERE IS A HIGH REJECTION RATE FOR CASTING POURED AT RIA BECAUSE MODERN TECHNIQUES ARE NOT USED TO MEASURE AND CONTROL PROCESS PARAMETERS AND POROSITY.						
	SOLUTION - PROCEDURES TO MINIMIZE DISSOLVED GAS AND TO MORE ACCURATELY MEASURE GAS CONCENTRATIONS WILL BE ESTABLISHED. METHODS OF MEASURING TEMPERATURES AND COMPOSITIONS OF ATMOSPHERES IN FURNACES AT RIA WILL BE ESTABLISHED.						
(8516)	TITLE - COMPOUNDING OF CUTTING FLUIDS + OILS FOR PRODUCTION				144		
	PROBLEM - PRESENT MACHINING OPERATIONS UTILIZE PROPRIETARY CUTTING FLUIDS AND OILS, THUS PRESENTING POTENTIAL PROBLEMS OF INCOMPATIBILITY AND THEREBY REQUIRING THE USE OF SOLE SOURCE PROCUREMENT PRACTICES.						
	SOLUTION - ELIMINATE THE USE OF PROPRIETARY CUTTING FLUIDS AND OILS BY COMPOUNDING THEM FROM COMPETITIVELY PROCURED INGREDIENTS.						
(8700)	TITLE - APPLICATION OF ENERGY-ADAPTIVE CONTROLS TO GRINDING (CAM)						125
(8701)	TITLE - APPLICATION OF ROBOTIZED WORKPIECE HANDLING AND FIXTURING						100
COMPONENT -- RECOIL MECHANISMS							
(8250)	TITLE - IMPROVED FABRICATION OF RECOIL WEAR SURFACES			28	269		
	PROBLEM - PRESENTLY GRINDING AND HONING OPERATIONS ON WEAR SURFACES RESULT IN PARTICLE INCLUSIONS WHICH COME IN CONTACT HYDRAULIC FLUID AND PRODUCE HIGH RATES OF WEAR.						
	SOLUTION - USING ADVANCED METHODS REMOVE FOREIGN PARTICLES PRIOR TO THE FINAL GRINDING OR HONING OPERATIONS OR, IF MORE EFFECTIVE, AFTER FINAL GRINDING OR HONING.						
(8422)	TITLE - HONE FORMING OF RECOIL CYCLINDERS					95	345
	PROBLEM - REPLACEMENT OF SCARRED, WORN OR MISMACHINED RECOIL CYCLINDERS ARE COSTLY AND TIME-CONSUMING IN TERMS OF LONG-LEAD TIMES FOR MATERIAL DELIVERY AND MACHINING. CYCLINDER REPLACEMENT REQUIRES ADDITIONAL CONSUMPTION OF STRATEGIC MATERIALS.						
	SOLUTION - HONE FORMING IS A SIMULTANEOUS PROCESS WHERE HONING AND MATERIAL BUILDOUT BY ELECTROPLATING TAKE PLACE TO ACHIEVE THE DESIRED DIMENSION AND FINISH. COST SAVINGS CAN BE ACHIEVED WITH THE PROCESS FOR RECOIL CYCLINDER MANUFACTURE AND RECLAIMATION.						

	FUNDING ($000)				
	PRIOR	83	84	85	86	87
COMPONENT -- RECOIL MECHANISMS (CONTINUED)						
(8511) TITLE - CASTING OF ANTIFRICTION METAL COMPONENTS				220	70	
PROBLEM - ANTIFRICTION METAL FOR PACKING GLANDS IN RECOIL MECHANISMS IS PRESENTLY HAND CAST. OVER 70-80 PERCENT OF THE METAL IS EXCESS + HAS TO BE MACHINED OFF AT ADDED COST.						
SOLUTION - USE OF DIE CAST PROCESS WILL REDUCE EXCESS METAL AND THE PROCESS WILL REDUCE CASTING DEFECTS.						
(8607) TITLE - AUTOMATED FLUSHING OF RECOIL SYSTEMS TO REDUCE CONTAMINATION					150	
PROBLEM - INEFFECTIVE CLEANING OF MACHINED SURFACES CAUSES METALLIC CONTAMINATION OF THE HYDRAULIC FLUID AFTER THE RECOIL SYSTEM IS ASSEMBLED. SUCH CONTAMINANTS ARE DIFFICULT TO REMOVE WITH NORMAL FLUSHING PROCEDURES.						
SOLUTION - ESTABLISH AN AUTOMATED FLUSHING SYSTEM INCORPORATING HIGH PRESSURE TO REMOVE METALLIC CONTAMINATION FROM THE HYDRAULIC FLUID. THIS WILL REDUCE THE NUMBER OF REJECTIONS OF ASSEMBLED RECOIL MECHANISMS AFTER MECHANICAL CYMNASTICATION.						
(8612) TITLE - ELECTROSLAG REMELTING FOR WEAPON COMPONENTS					75	60
PROBLEM - CYLINDRICAL STEEL CASTINGS USED IN RECOIL CYLINDERS ARE OFTEN REJECTED DURING MACHINING BECAUSE OF POROSITY OR INCLUSIONS. DURING QUENCH, FORGED CYLINDRICAL PARTS CRACK DUE TO THESE INTERNAL DEFECTS.						
SOLUTION - CAST THESE COMPONENTS USING ESR TO ELIMINATE HOT TEARING AND SHRINKAGE AND REDUCE THE LIKELYHOOD OF CRACKING DURING QUENCHING. COMPONENTS MADE WITH THIS PROCESS WILL BE RELATIVELY INCLUSION-FREE.						
(8703) TITLE - AUTOMATED RECOIL MECHANISM ASSEMBLY						150
PROBLEM - ASSEMBLY AND TESTING OF RECOIL MECHANISMS IN SMALL LOTS AT ROCK ISLAND ARSENAL IS A MANUAL, TIME-CONSUMING PROCESS. TECHNOLOGY SUCH AS INDUSTRIAL ROBOTS AND MICROPROCESSOR CONTROLLED TESTING EQUIPMENT CAN IMPROVE THIS PROCESS.						
SOLUTION - ANALYZE THE CURRENT MANUAL METHOD OF ASSEMBLYING THE HYDRAULIC, PNEUMATIC, AND MECHANICAL PARTS OF RECOIL MECHANISMS. IDENTIFY AREAS WHERE AUTOMATED METHODS CAN BE APPLIED. DEVELOP AND INSTALL THOSE METHODS WHICH PROVE COST EFFECTIVE.						
COMPONENT -- TUBES						
(8103) TITLE - HIGH VELOCITY MACHINING	37	285	160		40	
PROBLEM - SPEED OF MACHINING CANNON TUBES IS LIMITED WITH CURRENT EQUIPMENT.						
SOLUTION - EVALUATE HIGH SPEED METAL REMOVAL METHODS AND AVAILABLE EQUIPMENT. FUTURE YEARS FUNDING WILL PROVIDE FOR ACQUISITION AND TESTING OF NEW MACHINE AND PROCESS.						

COMPONENT -- TUBES (CONTINUED)

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
(8153)	TITLE - INCREASING GUN TUBE HEAT TREATMENT CAPACITY			250			
	PROBLEM - OIL-FIRED SELAS CONTINUOUS HEAT TREATING CANNOT MEET THE PRODUCTION CAPACITY OF THE ROTARY FORGE. THE OUTPUT OF THE HEAT TREAT LINE MUST BE INCREASED THREE-FOLD TO MEET MOBILIZATION REQUIREMENTS.						
	SOLUTION - INCREASE CAPACITY BY MODIFYING PRESENT SYSTEM, ADDING SECOND MODIFIED SYSTEM, ADDING A STABILIZING FURNACE, AND SHORTENING AUSTENITIZATION CYCLE. ANOTHER POSSIBILITY IS TO USE RAPID HEATING RATES AVAILABLE WITH INDUCTION HEATING TO REDUCE TIME NEED.						
(8241)	TITLE - COMPUTER APPLICATIONS TO BORE GUIDANCE	308		85			
	PROBLEM - THE BORE GUIDANCE SYSTEM CONSISTS OF MANY INTERDEPENDENT ELEMENTS MAKING IT DIFFICULT AND TIME CONSUMING TO DIAGNOSE PROBLEMS. ALSO, TUBES WITH LARGE WALL VARIATIONS GREATLY INCREASE THE DIFFICULTY IN MAINTAINING CONTROL.						
	SOLUTION - COMPUTER CONTROL WILL MAKE POSSIBLE SUCH FEATURES AS SELF TESTING, CHECKING, MONITORING, AND CALIBERATIN IN CONTROL, TEST, AND MEASUREMENT SYSTEMS.						
(8243)	TITLE - COMPUTER CONTROLLED CHROMIUM PLATING PROCESS	301	260				
	PROBLEM - CHROMIUM PLATING OF CANNON BARRELS IS A COMPLICATED, MULTI-STAGE PROCESS WHICH IS MANUALLY CONTROLLED. MANUAL MANIPULATION OF VALVE STRESS, ETC., IS SLOW, SOMETIMES HAZARDOUS, AND CAN RESULT IN DEGRADED DEPOSIT QUALITY DUE TO HUMAN ERROR.						
	SOLUTION - THE CRITICAL STAGES OF THE CHROMIUM PLATING PROCESS WILL BE IDENTIFIED AND A PROGRAMMABLE CONTROLLER(S) DEVELOPED TO REDUCE TO NEAR ZERO THE MANIPULATION FUNCTIONS REQUIRED OF AN OPERATOR.						
(8245)	TITLE - LOW CONTRACTION (LC) CHROMIUM PLATING	241	195				
	PROBLEM - HIGH CONTRACTION CHROMIUM COATING IS CURRENTLY USED TO RESIST EROSION IN GUN BORES. INHERENT PROPERTIES MAKE THE COATING SUSCEPTIBLE TO SHEARING AND FLAKING.						
	SOLUTION - PLATING WITH LOW CONTRACTION CHROMIUM WILL GIVE A MARKED INCREASE IN WEAR RESISTANCE DUE TO ITS SUPERIOR CHARACTERISTICS. DESIGN SPECS FOR MOD OF EXISTING FACILITIES WILL PERMIT PROPER APPLICATION.						
(8351)	TITLE - IMP MFG OF QUADRANT FLATS + MUZZLE BRAKE		88		350		30
	PROBLEM - PRESENT METHODS OF MACHINING FLATS AND KEYWAYS REQUIRE TWO SET-UPS ON TWO SEPARATE MACHINE TOOLS WITH ATTENDANT MATERIEL HANDLING REQUIREMENTS.						
	SOLUTION - DESIGN A DUAL MACHINING SYSTEM CAPABLE OF MANUFACTURING BOTH THE KEYWAY AND THE LEVELING FLATS IN A SINGLE SET-UP, FABICATE AND RETROFIT TO CURRENT EQUIPMENT.						

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- TUBES (CONTINUED)							
(8352)	TITLE - SKIVING OF GUN TUBE BORES		120		575		
	PROBLEM - INTERMEDIATE TUBE BORE HONING OPERATIONS FOR SURFACE FINISH AND SIZE CONTROL ARE A TIME CONSUMING, COSTLY METAL REMOVAL PROCESS., COUNTERBORING OPERATIONS PRIOR TO SWAGE AUTOFRETTAGE ARE ALSO SLOW, TIME CONSUMING, AND HIGH IN TOOLING COSTS.						
	SOLUTION - THE APPLICATION OF RECENTLY DEVELOPED SKIVING TECHNOLOGY AND EQUIPMENT WILL ELIMINATE COSTLY ROUGH HONING COUNTERBORING OPERATIONS.						
(8354)	TITLE - CUTTING OF HOT ROTARY FORGED TUBES		414				
	PROBLEM - CUTT-OFF OF MUZZLE AND BREECH ENDS OF ROTARY FORGED TUBES IS A COSTLY AND INEFFICIENT OPERATION PRIOR TO HEAT TREATING.						
	SOLUTION - ABRASIVE CUTTING WILL ELIMINATE A BOTTLENECK OPERATION AND REDUCE CUTTING TIME.						
(8430)	TITLE - AUTOMATED WELDING OF ROTARY FORGE HAMMERS			137			
	PROBLEM - CURRENT METHOD TO WELD A WEAR RESISTANT OVERLAY ON ROTARY FORGE HAMMERS IS A TIME CONSUMING, MANUAL PROCESS. QUALITY DEPENDS ON OPERATOR SKILL.						
	SOLUTION - AUTOMATE THE PROCESS BY OBTAINING WELDING ALLOY IN A FLUX-CORE METAL WIRE FORM, USABLE ON EXISTING AUTOMATIC WELDING EQUIPMENT.						
(8431)	TITLE - AUTOMATED WELDING OF BORE EVACUATORS			215			
	PROBLEM - PRESENT PROCEDURE DOES NOT ENABLE WELDING BORE EVACUATORS INSIDE AND OUTSIDE SIMULTANEOUSLY. THUS, ENERGY AND TIME ARE WASTED.						
	SOLUTION - EMPLOY SPECIAL EQUIPMENT AND PROCEDURES TO PERMIT COMBINING THESE OPERATIONS.						
(8433)	TITLE - IN PROCESS CONTROL OF SELAS HEAT TREAT SYSTEM (CAM)			125			
	PROBLEM - AS GUN TUBES ARE HEAT TREATED THE ACTUAL WORKPIECE TEMPERATURE IS NOT KNOWN UNTIL THE PIECE EXITS THE FURNACE. EXCESSIVE FORGING TEMPERATURES CAN DEGRADE MECHANICAL PROPERTIES.						
	SOLUTION - AUTOMATICALLY CONTROL FURNACE TEMPERATURES BY MONITORING THE ACTUAL WORKPIECE TEMPERATURE, AND FEEDING THIS DATA TO MICROPROCESSORS.						
(8439)	TITLE - IMPROVED RIFLING PROCEDURES			80			
	PROBLEM - RIFLING HEADS USED TO HOLD BROACH CUTTERS IN THE RIFLING OPERATION ARE SUBJECT TO EXCESSIVE WEAR, NECESSITATING SIGNIFICANT MAINTENANCE AND REPAIR EXPENDITURE.						
	SOLUTION - DESIGN A NEW RIFLING HEAD THAT IS NOT SUBJECT TO WEAR, THEREBY ELIMINATING MAINTENANCE AND REPAIR EXPENDITURE ASSOCIATED WITH WORN RIFLING HEADS.						

		FUNDING ($000)				
	PRIOR	83	84	85	86	87

COMPONENT -- TUBES (CONTINUED)

(6442) TITLE - IMPROVED CUTTING OF CHARPY AND TENSILE BLANKS — 84: 80

PROBLEM - CANNON TUBE TEST SPECIMEN BLANKS ARE SAWED MANUALLY. THIS METHOD IS TIME CONSUMING AND OFTEN RESULTS IN BLANKS THAT ARE OVERSIZED AND REQUIRE ADDITIONAL MACHINING OPERATIONS.

SOLUTION - ADAPT HIGH SPEED CUTTING PROCEDURES AND AUTOMATED HANDLING TECHNIQUES IN ORDER TO DECREASE MACHINING TIME AND ELIMINATE SUBSEQUENT MACHINING OPERATIONS.

(6449) TITLE - OPTIMAL RIFLING CONFIGURATION FOR CHROME PLATING — 84: 228; 85: 180

PROBLEM - EARLY FAILURE OF CHROMIUM COATINGS IN GUN TUBES OCCURS AT THE SHARP CORNERS OF THE LAND RUN-UP. PRESENTLY NO EFFECTIVE METHOD OR TOOL IS AVAILABLE TO ELIMINATE THIS CONDITION.

SOLUTION - DEVELOP A METHOD AND APPROPRIATE TOOLING TO ALTER THE RIFLING PROFILE OF GUN TUBES.

(6473) TITLE - APPL FUSED SALT PROCESS TO COAT TANTALUM ON L CAL LINERS — 86: 95; 87: 185

PROBLEM - PRESENTLY NO FULL SCALE PRODUCTION CAPABILITY EXISTS AT WATERVLIET ARSENAL TO APPLY TANTALUM TO THE I. D. OF LARGE LINERS. THESE COATINGS MUST BE DEPOSITED FROM A FUSED SALT BATH.

SOLUTION - ESTABLISH THE CAPABILITY TO COAT LARGE CALIBER LINERS ON A PRODUCTION BASIS.

(6474) TITLE - APPL OF PARTIAL REFRACTORY LINERS TO CANNON TUBES — 84: 389; 85: 290

PROBLEM - FUTURE CANNON TUBES WILL BE SUBJECTED TO HIGHER TEMPERATURE, PRESSURE AND VELOCITY. TUBES AS NOW DESIGNED WILL WEAR OUT MUCH FASTER. PROTOTYPE EQUIPMENT TO INSTALL ADVANCED TECHNOLOGY LINERS IN TUBES NOW EXISTS.

SOLUTION - MODIFY THE EXISITNG PROTOTYPAL FACILITY TO HANDLE ALL CURRENT AND FORESEEN PRODUCTION TUBES. INSTALL ADVANCED TECHNOLOGY LINERS USING THIS EQUIPMENT.

(8544) TITLE - WIRE E.D.M. MACHINING OF RIFLING BROACHES — 86: 35; 87: 195

PROBLEM - BROACH CUTTER TEETH ARE FORMED BY ROUGH PLUNGE GRINDING USING BORAZON CBN WHEELS. FINISHING IS DONE BY FORMING STANDARD ALUMINUM OXIDE WHEELS AND GRINDING THE BROACH TEETH ON THESE WHEELS, WHICH BREAK DOWN FREQUENTLY AND REQUIRE MUCH REDRESS.

SOLUTION - FORM THE BROACH TEETH VIA CNC CONTROLLED E.D.M.

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- TUBES (CONTINUED)							
(8549)	TITLE - NDT TESTING OF ROTARY FORGED MANDRELS				199		
	PROBLEM - MANDRELS FAIL WITHOUT WARNING DURING THE FORGING OPERATION. THERE IS NO METHOD OF DETECTING DEFECTS UNLESS THE MANDREL IS REMOVED FROM THE FORGING MACHINE.						
	SOLUTION - THE APPLICATION OF AN ULTRASONIC ELECTROMAGNETIC ACOUSTIC TRANSMISSION (EMAT) NDT SYSTEM THAT IS CAPABLE OF INSPECTING THE MANDREL BEFORE, AND AFTER THE FORGING OPERATION WHILE THE MANDREL IS STILL ATTACHED TO THE BAR HOLDER.						
(8550)	TITLE - BALANCED TUBE MACHINING					25	70
	PROBLEM - IN MACHINING LONG WORKPIECES, STEADY REST SUPPORTS USED TO RESTRAIN THE WORKPIECE (GUN TUBE) DO NOT ALLOW NATURAL DISTORTIONS (CAUSED BY CUTTING TOOL FORCES) TO OCCUR. WHEN THE TUBE IS LOOSENED FROM THE STEADY REST, RELEASED FORCES YIELD BENT TUBE.						
	SOLUTION - APPLY OPPOSITELY POSITIONED CUTTING TOOLS, THEREBY MINIMIZING TUBE DEFLECTION AND ELIMINATING THE NEED FOR CONVENTIONAL STEADY REST SUPPORT.						
(8552)	TITLE - ELECTROPOLISHING TO IMPROVE TUBE FATIGUE LIFE					55	
	PROBLEM - STRESS CONCENTRATION AREAS SUFFER FROM AMPLIFIED FATIGUE CRACKING AND ARE THE CAUSE OF EARLY TUBE CONDEMNATION. THE 155MMM M185 KEYWAY SLOT AND THE 105MM M68 BREECH THREAD FEATURES ARE EXAMPLES OF EARLY FATIGUE CRACKING.						
	SOLUTION - THE REDUCTION OR ELIMINATION OF THE STRESSES WILL BE ACCOMPLISHED BY THE USE OF EXTERNAL ANODES CONFIGURED TO MATCH THE AREA TO BE TREATED.						
(8621)	TITLE - SPRAY ROLLING FOR TUBE MANUFACTURE					285	
	PROBLEM - BOTH GUN TUBE AND LINER MFG INVOLVE CLASSICAL WROUGHT INGOT METALLURGICAL PROCESSING THAT ENTAIL LARGE EXPENDITURES OF ENERGY AND SIGNIFICANT MATERIAL CROPPING LOSSES.						
	SOLUTION - SPRAY FORMING PROVIDES A NEW APPROACH WHICH POTENTIALLY COMBINES ECONOMY WITH MATERIAL PROPERTY IMPROVEMENT. THE DIRECT ROLLING OF SPLAT-SPRAYED PRE-FORMULATED METAL POWDERS FOLLOWED BY CONSOLIDATION THROUGH SWAGING OFFERS IMPROVED PROPERTIES.						
(8711)	TITLE - CERAMIC GUN TUBE PROCESSING						240
	PROBLEM - WITH THE ADVENT OF HOTTER, FASTER PROPELLANTS, GUN TUBE TEMPERATURE + WEAR WILL INCREASE BEYOND THE LIMITS OF PRACTICAL METALLURGY. CERAMIC LINER INSERTS ARE A SOLUTION BUT THE STRENGTH RELIABILITY OF CERAMICS MUST BE ADDRESSED.						
	SOLUTION - APPLICATION OF STATE OF THE ART HOT ISOSTATIC PRESSING TECHNOLOGY TO FORM HIGH STRENGTH CERAMICS OF CONTROLLED DEFECT SIZE.						

CATEGORY
POLLUTION ABATEMENT

FUNDING ($000)

	PRIOR	83	84	85	86	87

COMPONENT -- GENERAL

(8530) TITLE - NON-TOXIC COOLANT FOR HIGH SPEED MACHINING — 100

PROBLEM - HIGH SPEED MACHINING CREATES HIGHER PRESSURES, TEMPERATURES, AND VELOCITIES IN THE TOOL/WORKPIECE INTERFACE. PRESENT COOLANT MATERIALS ARE NOT VOLATILE ENOUGH TO PROVIDE SUFFICIENT COOLING AND LUBRICITY.

SOLUTION - NEW COOLANTS ARE NEEDED WITH INCREASED VOLATILITY TO BOTH COOL AND LUBRICATE THE WORKPIECE. CARE IN SELECTION IS NECESSARY TO AVOID THE USE OF HIGHER VOLATILE MATERIALS THAT MAY BE TOXIC.

COMPONENT -- MISCELLANEOUS

(8555) TITLE - POLLUTION CONTROL THRU ZERO DISCHARGE — 200 — 95

PROBLEM - THE PRESENT CHEMICAL AND WASTE DISPOSABLE SYSTEM IS INADEQUATE TO EFFECTIVELY AND ECONOMICALLY CONTROL TOXIC POLLUTANTS CREATED WITHIN THE METAL FINISHING AREAS. NO RECYCLING FACILITY EXISTS TO RECLAIM SOLUTIONS OR TO MINIMIZE POLLUTANT DISCHARGE.

SOLUTION - DESIGN AND FABRICATE A PROTOTYPE SYSTEM THAT CAN PROCESS THE POLLUTANTS GENERATED WITH A NEAR ZERO LIQUID DISCHARGE FROM THE METAL FINISHING AREAS. THE SYSTEM COULD BE EITH A CLSD LOOP EVAP REC SYS, A RO UNIT, AN ION EXCHGE OR COMB OF TWO OF THEM.

CATEGORY
QUALITY CONTROL/TESTING

COMPONENT -- FIRE CONTROL

(8561) TITLE - DIGITAL IMAGE DIAGNOSTIC TECHNIQUES — 135 — 150

PROBLEM - VISUAL INSPECTION ERRORS DUE TO OPERATOR EYE FATIGUE, BOREDOM, INATTENTIVENESS CAN OCCUR AT MANUFACTURING FACILITIES,THAT LEAD TO COSTLY DISASSEMBLING PROCEDURES.

SOLUTION - REDUCTION OF VISUAL INSPECTION TIME AND ERRORS THROUGH USE OF AN AUTOMATED DIGITAL IMAGE PROCESSING INSPECTION TECHNIQUE AND DEVICE.

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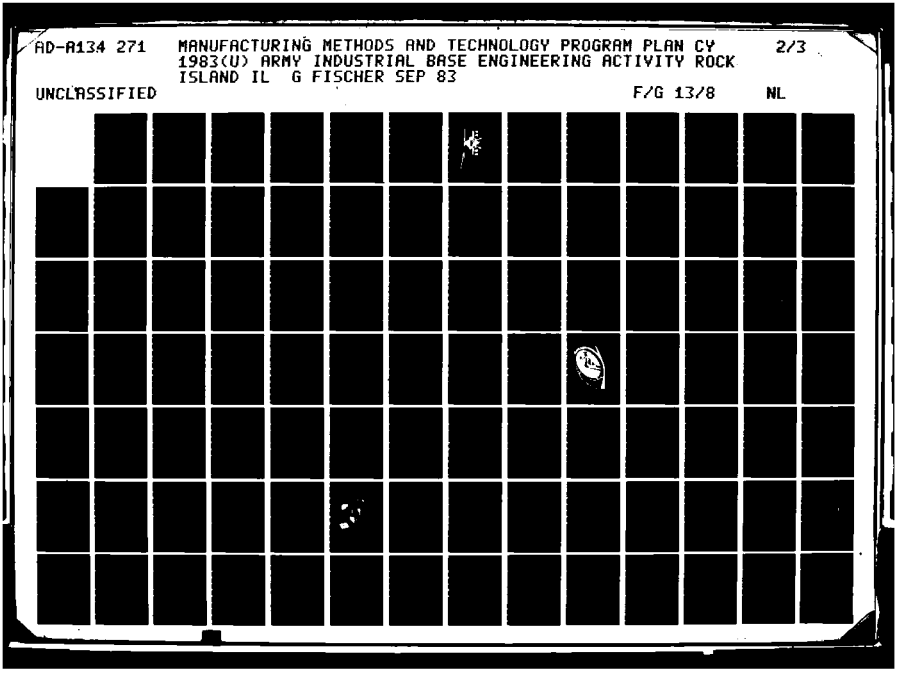
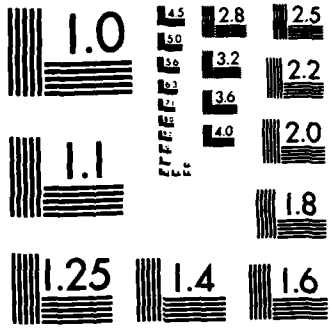




		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT	-- GUN SYSTEMS						
(8370)	TITLE - AUTOMATED INSPECTION OF WEAPONS COMPONENTS	193		337	359		
	PROBLEM - FOR BARREL MFG, CURRENT HAND GAGED INSPECTION IS A MAJOR TIME FACTOR. BARREL STRAIGHTENING IS ALSO DONE MANUALLY AS MANY AS 13 TIMES DURING THE MFG CYCLE. NEW DNC EQUIP BEING PROCURED VIA PIF 68X7986 REQUIRES CENTRAL CONTROL.						
	SOLUTION - AUTOMATE, TO MAX FEASIBLE DEGREE, INSPECTION OPERATIONS. USING LASER TECHNOLOGY, EQUIP A STRAIGHTENING PRESS WITH FEEDBACK CONTROL TO SELECT LOCATION FOR APPLICATION OF BENDING FORCES. CONTROL ALL DNC EQUIPMENT WITH A CNC MASTER UNIT.						
(8415)	TITLE - ROBOTIC EMPLACEMENT DEVICE FOR INSPECTION BY X-RAY (REDIX)					180	
	PROBLEM - RADIOGRAPHIC INSPECTION IS USED EXTENSIVELY TO ASSURE THE QUALITY OF HOWITZER CARRIAGES DURING MFG. TO OBTAIN SATISFACTORY X-RAYS ALIGNMENT IS CRITICAL. USING THE PRESENT METHOD CONSISTENCY OF EXPOSURE IS IMPOSSIBLE.						
	SOLUTION - REPLACE THE MANUAL RADIOGRAPHIC POSITIONING WITH AN AUTOMATED ROBOTIC DEVICE CAPABLE OF PRECISELY ALIGNING WELDMENTS AND CASTING						
(8434)	TITLE - EDDY CURRENT INSPECTION OF GUN TUBES			118			
	PROBLEM - THE CURRENT GUN TUBE PRODUCTION ID INSPECTION TECHNIQUES, BORESCOPE AND MAGNETIC PARTICLE, ARE SLOW AND SUBJECT OPERATOR ERROR. THESE TECHNIQUES DO NOT HAVE THE CAPABILITY TO PRODUCE PERMANENT RECORDS OF FLAW LOCATIONS.						
	SOLUTION - DEVELOP A EDDY CURRENT INSPECTION SYSTEM HAS THE CAPABILITY TO DETECT AND PERMANENTLY RECORD SURFACE CRACKS OF .010 INCHES DEEP DURING THE MACHINING PROCESS. THIS TECHNIQUE WILL ADD ONLY ONE MINUTE TO THE MACHINING PROCESS						
(8436)	TITLE - QUENCH CYCLE PROFILE MEASUREMENT SYSTEM				147	55	
	PROBLEM - THE QUENCH CYCLE DURING HEAT TREAT PLAYS AN IMPORTANT PART IN THE QUALITY OF GUN TUBE FORGINGS. QUENCH CRACKS HAVE BEEN OCCURING IN THE MUZZLE END OF 105 MM ROTARY FORGED GUN TUBES. THE CURRENT QUENCH CYCLE HAS LITTLE OR NO CONTROL.						
	SOLUTION - DEVELOP A NONCONTACT EDDY CURRENT AND/OR NONCONTACT EMAT(ELECTROMAGNETIC ACOUSTICAL TRANSMISSION) ULTRASONIC SYSTEM TO PROVIDE QUENCH CYCLE TEMPERATURE TIME TRANSFORMATION INFORMATION ON REAL TIME BASIS.						
(8508)	TITLE - COMPUTERIZED RADIOGRAPHIC INSPECTION OF WEAPON COMPONENTS				470		
	PROBLEM - NON-DESTRUCTIVE X-RAY INSPECTION AT ROCK ISLAND ARSENAL IS DONE MANUALLY BY SKILLED OPERATORS. COMPONENTS + SUBSYSTEMS FOR GUN MOUNTS + RECOIL MECHANISMS REQUIRE 100 PCT INSPECTION + ARCHIVING OF DETAILED INSPECTION RESULTS, A LABOR INTENSIVE TASK.						
	SOLUTION - AUTOMATED RADIOGRAPHIC SYSTEM WILL BE DESIGNED AND PROCURED. SYSTEM REQUIREMENTS WILL INCLUDE ALL COMPONENTS X-RAY INSPECTED AT RIA. ALSO FILMLESS INSPECTION, ANALYSIS AND ARCHIVING REQUIREMENTS WILL BE INCLUDED.						

	FUNDING ($000)				
	PRIOR	83	84	85	86	87
COMPONENT -- GUN SYSTEMS (CONTINUED)						
(8510) TITLE - AUTOMATED INSPECTION OF RECOIL COMPONENTS				140	230	
PROBLEM - MANY COMPONENTS ARE UNSALVAGEABLE BECAUSE CYLINDRICITY IS LOST AFTER A MANUFACTURING PROCESS OR UNACCEPTABLE SURFACE INTEGRITY. THESE COMPONENTS ARE USUALLY UNDETECTED UNTIL NEEDLESS STEPS IN THE PROCESS ROUTINGS HAVE BEEN PERFORMED.						
SOLUTION - A COMPUTERIZED MEASURING AND RECORDING SYSTEM WILL BE ASSEMBLED AND APPLIED TO THE DETERMINATION OF CYLINDRICITY OF HOLES AND ROUND STOCK PRIOR TO AND THROUGHOUT FABRICATION.						
(8573) TITLE - GENERIC GUN GYMNASTICATOR				100	570	
PROBLEM - LIVE FIRINGS ARE CURRENTLY USED TO RESOLVE ACCEPTANCE TESTS AND MALFUNCTION PROBLEMS ASSOCIATED WITH AUTOMATIC CANNONS (20-40MM). CYCLING THESE WEAPONS USING LIVE AMMUNITION IS EXCESSIVELY COSTLY AND TIME CONSUMING.						
SOLUTION - FABRICATE A GENERIC GUN GYMNASTICATOR TO CYCLE AUTOMATIC CANNONS MECHANICALLY. THIS WILL ELIMINATE LIVE TEST FIRINGS AND THE ASSOCIATED COSTS (AMMUNITION, FIRING RANGE COSTS, TRANSPORTATION CHARGES, ETC). TESTING TIME WILL BE REDUCED.						
(8630) TITLE - NDT OF RAW MATERIAL FOR WEAPON COMPONENTS					115	
PROBLEM - PRESENT INSPECTION OF MATERIAL CLEANLINESS IS INADEQUATE. CONSEQUENTLY, MATERIAL DEFICIENCIES GO UNDETECTED UNTIL THE FINAL STAGES OF THE MANUFACTURING PROCESS WHICH RESULTS IN HIGH SCRAP/REWORK COSTS AND LOSS OF LABOR.						
SOLUTION - APPLY A SCANNING TYPE NDT SYSTEM FOR AUTOMATIC CLEANLINESS INSPECTION OF RAW MATERIAL TO DETECT DETRIMENTAL DEFECTS IN THE MATERIAL BEFORE MACHINING.						
COMPONENT -- MISCELLANEOUS						
(8628) TITLE - QA SUPPORT COMPUTER SYSTEM					65	
PROBLEM - QA PROGRAM INFORMATION AND PROCESSING OF DATA REQUIRES OFF-LINE INTERFACING WITH ENGINEERING AND MANUFACTURING RESULTING IN A LACK OF REAL TIME RESPONSE.						
SOLUTION - IDENTIFY COMPUTER HARDWARE AND SOFTWARE NEEDS FOR ON-LINE PROCESSING AND RETRIEVAL OF INSPECTION DATA. ACCESS/INTEGRATE ENGINEERING AND MANUFACTURING DATA REQUIRED FOR ANALYSIS AND REPORTING OF THE QUALITY ASSURANCE FUNCTIONS.						

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- MISCELLANEOUS (CONTINUED)							
(8629)	TITLE - ULTRASONIC TEST APPLICATION FOR WEAPON COMPONENTS					105	
	PROBLEM - PRESENT PROCESS CONTROL TESTING OF CASTINGS, FORGINGS, AND METAL PARTS TO ENSURE MATERIAL INTEGRITY IS SLOW AND COSTLY. ULTRASONIC TESTING IS BEING APPLIED IN INDUSTRIAL OPERATIONS TO REPLACE OTHER HIGH COST, INEFFICIENT NDT METHODS.						
	SOLUTION - IDENTIFY POTENTIAL AREAS FOR APPLICATION OF ULTRASONIC TESTING AT RIA. IDENTIFY THE POTENTIAL FOR APPLYING ULTRASONICS AND DETERMINE THE TYPE OF ULTRASONIC SYSTEM TO BE USED.						

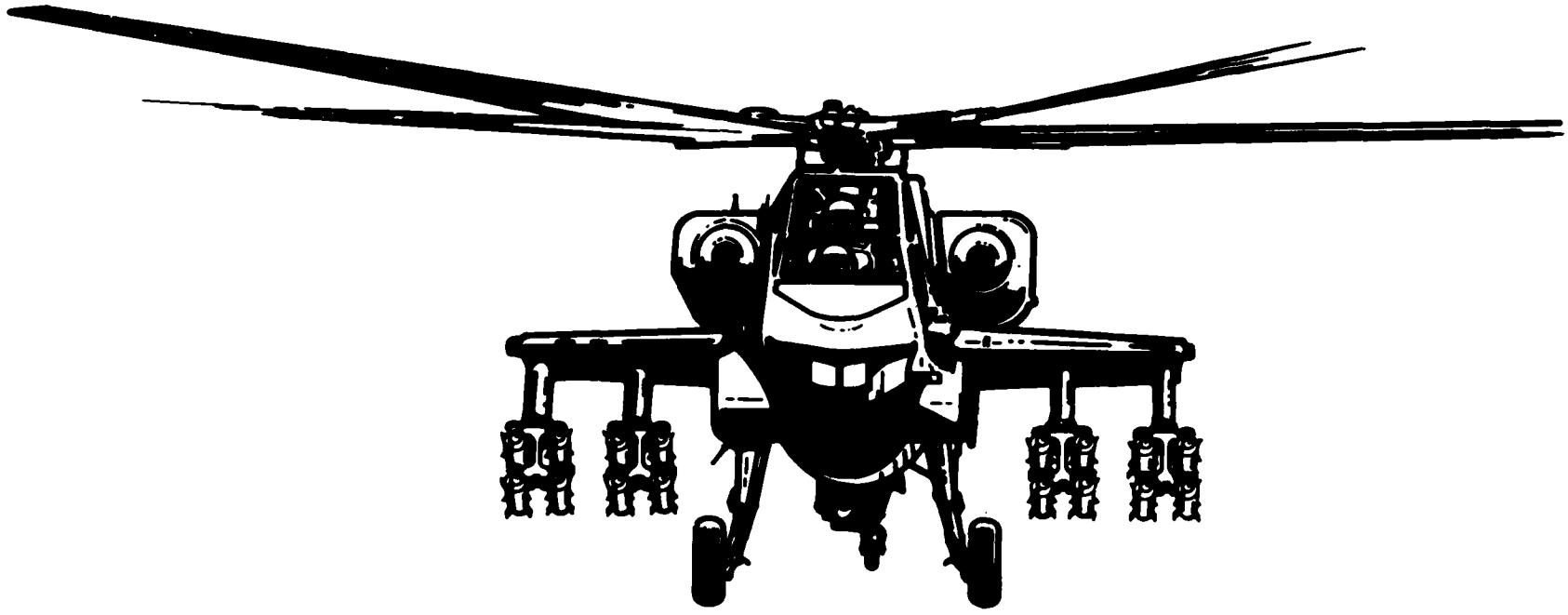
CATEGORY
SMALL CALIBER

COMPONENT -- BARRELS

(7965)	TITLE - SMALL ARMS WEAPONS NEW PROCESS PRODUCTION TECHNOLOGY	1479			900		
	PROBLEM - GUN BARREL MFG PROCEDURES REFLECT ANTIQUATED TECHNOLOGY AND RELY ON MASS REMOVAL OF MATERIAL BY CONVENTIONAL MACHINING METHODS. CURRENT EQUIP REPRESENTS 1940-50 TECHNOLOGY. NEW MATERIALS COMPOUND THE PROBLEM.						
	SOLUTION - REDUCE TO PRACTICE NEW TECHNIQUES FOR CAL 50 TO 40MM BARRELS BY ESTABLISHING THE TECHNOLOGY AND PROCESS EQUIPMENT REQUIRED TO BRIDGE GAP BETWEEN CAPABILITIES AND REQUIREMENTS.						
(6524)	TITLE - REFRACTORY METAL COATING FOR GUN TUBES					120	170
	PROBLEM - THERE IS A NEED TO PROVIDE IMPROVED RAPID FIRE GUN TUBES, AND A NEED TO REPLACE LINER MATERIALS MADE OF COBALT AND ITS ALLOYS (A CRITICAL STRATEGIC MATERIAL).						
	SOLUTION - DEVELOP AND OPTIMIZE THE PROCESS VARIABLES OF THE REFRACTORY METAL COATINGS AND THE APPLICATION PROCEDURES OF THESE COATINGS ON GUN BARREL LINERS.						
(8533)	TITLE - TECHNOLOGY FOR ERROSION RESISTANT COATING FOR GUN BARRELS					115	135
	PROBLEM - GUN BARRELS SUFFER ERROSION AT THE BREECH END OF THE WEAPON. CERAMICS OR REFRACTORY METALS MAY OFF-SET ERROSION BUT THE PROBLEM OF LINING THE BARREL WITH THESE MATERIALS HAS NOT BEEN RESOLVED ON FULL SCALE WEAPONS.						
	SOLUTION - DEMONSTATE THE APPLICATION OF COATINGS AND/OR LINERS ON SMALL AND LARGE CAL BARRELS. A CERAMIC (PERHAPS TITANIUM DIBORIDE) WOULD BE BEST IN SMALL BARRELS WHEREAS A REFRACTORY METAL (PERHAPS COLUMBIUM) WOULD BE BEST SUITED FOR LARGE BARRELS.						

		FUNDING ($000)				
	PRIOR	83	84	85	86	87
COMPONENT -- BARRELS (CONTINUED)						
(8536) TITLE - MOLYBDENUM ALLOY GUN BARREL LINERS					310	
PROBLEM - METHODS FOR PROCESSING MOLYBDENUM ALLOY ARE BEING STUDIED SO THAT ITS UNIQUE PROPERTIES CAN BE USED FOR SUSTAINED RAPID FIRE WEAPONS. IT WILL BE NECESSARY TO ESTABLISH AND APPLY THE METHODS ON AN ADEQUATE SCALE.						
SOLUTION - THE APPLICABILITY OF ONE OR MORE METHODS (HOT ISOSTATIC PRESSING, EXTRUSION, INJECTION MOLDING, ETC) WILL BE DEMONSTRATED. SPECIFICATIONS FOR MATERIALS AND PROCESSES WILL BE ESTABLISHED.						
COMPONENT -- COMPONENTS						
(8471) TITLE - SQUEEZE CASTING OF SMALL CAL WEAPONS					135	210
PROBLEM - A NUMBER OF SMALL ARMS WEAPONS COMPONENTS ARE FABRICATED BY COSTLY AND TIME CONSUMING MACHINING PROCEDURES IN WHICH A LARGE PORTION OF THE STARTING METAL STOCK ENDS UP AS MACHINING SCRAP.						
SOLUTION - THIXO FORGING PRESENTS A UNIQUE SOLUTION TO THE MACHINING PROBLEM. THE FORGING PROCEDURE ELIMINATES MOST OF THE TIME AND MONEY LOSSES EXPERIENCED WITH MACHINING, AND THE THIXO PROCEDURE ELIMINATES MUST OF THE CONVENTIONAL FORGING.						
COMPONENT -- GENERAL						
(8324) TITLE - PROCESS CONTROLS FOR P/M WEAPONS COMPONENTS		161	199	593		
PROBLEM - PRESENT METHODS OF PRODUCING WEAPON COMPONENTS IS MAINLY BY MACHINING FROM WROUGHT STOCK. THIS IS A HIGH COST METHOD WHICH PRODUCES MUCH ALLOY STEEL SCRAP.						
SOLUTION - FORGE PARTS FROM P/M STEEL FOR SAVINGS AND INCREASED DURABILITY AND REDUCED USE OF ALLOY STEEL.						
(8468) TITLE - IMPR MFG PLUS HANDLING TECHNIQUES FOR SMALL CAL WEAPONS					215	325
PROBLEM - CURRENT MANUAL MATERIALS HANDLING AND ASSEMBLY TECHNIQUES CAUSE NON-OPTIMAL MACHINE UTILIZATION AND HIGH LABOR COSTS.						
SOLUTION - DEMONSTRATE THE APPLICATION OF A MODIFIED GENERAL PURPOSE INDUSTRIAL ROBOT IN A PRODUCTION ENVIRONMENT FOR MATERIALS HANDLING. DEMONSTRATE THE APPLICATION OF A FLEXIBLY PROGRAMMED ASSEMBLY MACHINE FOR SMALL WEAPONS COMPONENTS.						

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- GENERAL (CONTINUED)							
(8525)	TITLE - GROUP TECHNOLOGY FOR S/C COMPONENT					115	160
	PROBLEM - PRIOR YEAR ICAM RELATED MMT PROJECTS DEVELOPED PROCESS PLANNING AND PART CLASSIFICATION SOFTWARE. HOWEVER NO DATA BASE HAS BEEN ASSEMBLED TO PERMIT THE SELECTION OF AN OPTIMUM PROCESS FOR A GIVEN PART OR ESTIMATING COSTS RELATED TO SUCH A PROCESS.						
	SOLUTION - A DATA BASE WILL BE DEVELOPED FOR FAMILIES OF MAJOR SMALL CALIBER 5.56MM -40MM WEAPONS COMPONENTS USING SOFTWARE ALREADY IN USE IN OTHER AREAS. DATA ON NEW PRODUCT CONFIGURATIONS WILL BE PROGRAMMED AND PROCESS PLANNING SYSTEMS EXERCISED.						
(8526)	TITLE - PROCESSING OF HIGH STRENGTH/LIGHT WEIGHT WEAPONS COMPONENTS						145
	PROBLEM - UTILIZATION OF METAL MATRIX TECHNOLOGY WILL DEPEND ON THE DEVELOPMENT OF A MFG BASE FOR THE ECONOMICAL FABRICATION OF HETEROGENEOUS MATERIALS. BY 1985, MATERIAL SYSTEMS AND PROCESSING/PROPERTY RQMTS WILL HAVE BEEN IDENTIFIED.						
	SOLUTION - DEFINE MATERIAL COMBINATIONS/PROPERTIES AND PROCESSING. PROTOTYPE FABRICATE COMPONENTS BY MORE ONE CONTRACTOR. EVALUATE THE MATERIAL BY RIGOROUS LAB TESTING AND IDENTIFY INSPECTION PROCEDURES.						
(8530)	TITLE - LIGHTWEIGHT P/M WEAPON COMPONENTS					115	155
	PROBLEM - MODERN WEAPONS REQUIRE THAT MATERIALS HAVE A HIGH SPECIFIC STRENGTH (STRENGTH TO DENSITY RATIO) IN ORDER TO REDUCE THEIR WEIGHT.						
	SOLUTION - THE AF AND NAVY HAVE DEVELOPED METAL MATRIX COMPOSITE MATERIALS THAT HAVE HIGHER SPECIFIC STRENGTHS THAN STEEL OR ALUMINUM ALLOYS. DEVELOP THE PROCESSING PARAMETERS FOR PRODUCING THESE MATERIALS INTO WEAPON COMPONENTS.						
(8662)	TITLE - FABRICATION OF PM WEAPON COMPONENTS					75	170
	PROBLEM - THE ARMY HAS BEEN SLOW TO TAKE ADVANTAGE OF THE POWDER METALLURGY PROCESS DUE TO THE LOW CORRELATION BETWEEN WROUGHT AND PM STEELS AND THE RESULTING CONFUSION CAUSED IN PROCUREMENT WHEN A PM PART IS SPECIFIED AS AN ALTERNATE TO A WROUGHT PART.						
	SOLUTION - DEVELOP MILITARY PROCESS SPECS FOR HIGH DENSITY AND COPPER INFILTRATED STEELS TO PERMIT INTERCHANGEABILITY BETWEEN WROUGHT AND PM WEAPON COMPONENTS, THUS AVOIDING THE NEED TO CHANGE THE DRAWING OR TDP FOR EACH COMPONENT.						
COMPONENT -- MISCELLANEOUS							
(8670)	TITLE - PROCESS CONTROL IMPROVEMENT IN SMALL CAL WEAPON FAB					120	



AVIATION
RESEARCH AND DEVELOPMENT COMMAND
(AVRADCOM)

US ARMY AVIATION RESEARCH AND DEVELOPMENT COMMAND

(AVRADCOM)

The US Army Aviation Research and Development Command (AVRADCOM), with headquarters at St. Louis, MO, is responsible for Army aviation research, development, product improvement, acquisition of assigned materiel, initial procurement, and production. The Command directs the Research and Technology Laboratories with headquarters at NASA - Ames Research Center, Moffett Field, CA; US Army Avionics Agency and Laboratory, Fort Monmouth, NJ; Applied Technology Laboratory at Ft. Eustis, VA; US Army Bell Plant Activity, Fort Worth, TX; and the US Army Hughes Plant Activity, Culver City, CA. Three project managers, Aircraft Survivability Equipment, CH-47 Modernization Program, and Navigation/Control Systems, are located at AVRADCOM. PM Apache and PM Blackhawk are located at AVRADCOM, but are under the direct control of HQ, DARCOM.

The overall emphasis of the Army's aviation MMT program is to perfect technologies which have a good probability of implementation and high potential benefits. For the most part, efforts are directed towards projects which offer both cost reductions and product improvements. The results of these projects will be made available to other Government agencies and to Industry.

The most important criteria of aircraft materials are strength and low weight. A large part of the aviation MMT program is dedicated to establishing processes to replace metals with materials which have better strength to weight ratios. Composite materials suitable for aviation have been developed and are being used; however, techniques for the production and application of composites need further development to achieve increased use.

The use of composite materials in Army aircraft is anticipated to increase as a result of current work in R&D and MT leading to an all-composite helicopter fuselage. Raw material costs are expected to decrease with the increased use of composites in DOD and Industry. Also, as confidence in the use of composites increases, reservations held by the design and (quality control groups) will diminish, and composites will be incorporated in the earliest stages of weapon development. This will result in increases in MMT work.

Composite projects are planned for virtually every part of the helicopter. Many projects are planned for airframe applications. One project will establish automated methods to eliminate many hand layup and cutting operations required for the fabrication of the cabin section. Another will establish technology for the use of self-contained integrally heated platin press tooling which will allow composite fabrication at low cost due to rapid cure time and producibility. A project planned in the rotor area will establish a manufacturing process for the main rotor blade of the Blackhawk. In the drive area, one project will focus on the drive shaft and another will result in methods for manufacturing a gearbox housing.

Several projects will attack technical problem areas that affect all composite manufacturing. These projects address automation of cutting and layup operations, and improvements in machining, fastening, and new materials. The development of automated techniques will be pursued in cooperation with the Air Force, the lead service in this area.

Perhaps the most significant project areas in terms of advancing composites manufacturing and usage is in the development of improved and new quality control techniques. Projects planned in this area will address materials characterization, in-process controls, and non-destructive evaluation. These projects will ensure optimum processing and material performance, which will increase confidence in composites.

There are many areas in aircraft in which metals can not be replaced. Projects have been submitted to improve production of these items. Since many aircraft metals used in the propulsion system are tough and expensive, maching to final shape is difficult and produces costly scrap. Improving powder metal technology will provide components much closer to final shape, greatly reducing the time and effort to produce the final product. Several projects are included to implement recent advances in gear manufacturing and should provide an improved item at a lower cost. An effort is planned to replace metal turbine blades with ceramic blades. This will provide better operating characteristics at lower cost.

AVRADCOM

COMMAND FUNDING SUMMARY
(THOUSANDS)

CATEGORY	FY83	FY84	FY85	FY86	FY87
AIRCRAFT EQUIPMENT	300	665	195	0	0
AIRFRAME	125	1660	2225	10580	9780
AVIONICS	0	165	300	610	3360
DRIVE SYSTEM	380	2425	3320	2955	5784
GENERAL	0	375	430	435	0
IPIP	2700	0	12500	6000	7000
ROTOR SYSTEM	446	2415	2260	3160	7500
TURBINE ENGINE	0	3785	7525	6203	10934
TOTAL	3951	11490	28755	29943	44358

CATEGORY	FUNDING ($000)					
	PRIOR	83	84	85	86	87
AIRCRAFT EQUIPMENT						
COMPONENT -- GENERAL						
(7470) TITLE - HAND HELD AUTOMATIC POWER CRIMPER			150			
PROBLEM - PRESENTLY UP TO 50 PERCENT OF THE WIRE TERMINATIONS OF THE HELICOPTER WIRE HARNESS ASSEMBLIES ARE ACCOMPLISHED ON THE HARNESS FORM BOARD AFTER THE WIRES ARE TIED INTO BUNDLES. TERMINALS ARE INSTALLED BY HAND WHICH IS TO TIME CONSUMING.						
SOLUTION - THIS PROJECT WILL DEVELOP A LIGHT WEIGHT, HAND-HELD, POWER TOOL WITH THE ABILITIES TO CHANGE THE CRIMPING DIE HEAD, BY EITHER A SNAP ON OR BY MEANS OF THREADING INTO THE POWER TOOL, AND TO ADJUST TO FIVE DIFFERENT MANUFACTURES GAGES.						
COMPONENT -- MISC COMPONENTS						
(7465) TITLE - ADVANCED COMPOSITE SENSOR SUPPORT STRUCTURE	300	515	195			
PROBLEM - THE CURRENT PROTOTYPE SENSOR SUPPORT STRUCTURE IS COMPOSED OF BERYLLIUM WHICH IS TOXIC, EXPENSIVE AND SOLE SOURCE SUPPLIED.						
SOLUTION - FABRICATE THE SUPPORT FROM RESIN MATRIX COMPOSITES.						
AIRFRAME						
COMPONENT -- FUSELAGE STRUCTURES						
(7367) TITLE - LOW COST RADAR CAMOUFLAGE AIRFRAME MATERIAL						100
PROBLEM - CURRENT CONST TECH FOR INTEGRAL RADAR CAMOUFLAGED, LOAD BEARING AIRFRAME MATERIALS REQUIRE LABOR INTENSIVE SECONDARY FABRICATION STEPS FOR INTEGRATING CAMOUFLAGED COMPONENTS INTO AIRFRAME STRUCTURES.						
SOLUTION - DEVELOP MATERIALS AND CONSTRUCTION TECHNIQUES WHICH PERMIT DIRECT INCORPORATION OF CAMOUFLAGE MATERIALS WITHIN THE COMPOSITE STRUCTURE. THIS WILL REDUCE THE OVERALL COST OF THE AIRFRAME STRUCTURE.						
(7462) TITLE - IMPROVED AIRFRAME MANUFACTURING TECHNOLOGY				1000	3000	2000
PROBLEM - THE GREATEST MANUFACTURING COST DRIVES IN ACAP WERE CABIN SECTION DUE TO ITS DESIGN AND GEOMETRIC COMPLEXITY WH[illegible] HAND LAYUP AND CUTTING OPERATIONS.						
SOLUTION - ESTABLISH AUTOMATED MANUFACTURING PROCESSES AND REDUCED CURING CYCLES. LOW COST TOOLING, FORMING MOLDS, AND CURING PROCESSES WILL BE DEVELOPED.						

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- FUSELAGE STRUCTURES (CONTINUED)							
(7468)	TITLE - INTEGRATION OF ADVANCED REPAIR BONDING			515			
	PROBLEM - CORPUS CHRISTI ARMY DEPOT IS EXPERIENCING PROBLEMS WITH THE ANALYSIS AND CONTROL OF BONDING QUALITY WITH ADHESIVES AND PRIMERS USED IN HONEYCOMB BONDING.						
	SOLUTION - ESTABLISH MANUFACTURING TECHNOLOGY REQUIRED TO INTEGRATE ALL OF THE KEY ELEMENTS NECESSARY FOR RELIABLE AND LOW COST REPAIRS OF ADHESIVELY BONDED STRUCTURES.						
(7488)	TITLE - FAST FLOW MANUFACTURING OF COMPOSITE MATERIALS				500	2500	
	PROBLEM - MAINTAINING CONTROL OF THOUSANDS OF COMPOSITE PLES DURING CUTTING, STACKING AND MODULARIZING OPERATIONS TO PREVENT EXCEEDING THE DEGREE OF POLYMERIZATION TIME/TEMPERATURE IS A MAJOR PROBLEM.						
	SOLUTION - DESIGN, DEMONSTRATE, AND VERIFY THE CAPABILITY FOR FAST FLOW FABRICATION FOR CONTROLLING WORK-IN-PROCESS, INVENTORY, EXPIRATION AND QUALITY OF COMPOSITE STRUCTURES THROUGH EACH FABRICATION SEQUENCE.						
(7494)	TITLE - POLYIMIDE ENGINE COWLINGS					290	
	PROBLEM - CURRENT HELICOPTER COWLINGS, MADE FROM CONDENSATION CURE POLYIMIDES, REQUIRE SPECIAL VENTING SYSTEMS DURING CURE AND HAVE HIGH VOID CONTENT IN THE LAMINATES BECAUSE OF THE VOLATILES GIVEN OFF DURING CURE.						
	SOLUTION - SUBSTITUTE AN ADDITION CURE POLYIMIDE IN THE HIGH TEMPERATURE ZONE COWLINGS AND OTHER STRUCTURES SUBJECTED TO TEMPERATURES IN THE 400-450 DEGREES F RANGE. IT IS PROPOSED TO USE ONE OF SEVERAL RECENTLY AVAILABLE BISMALEIMIDE RESIN SYSTEMS.						
(7495)	TITLE - VACUUM IMPREGNATION OF LARGE COCURED COMPOSITE STRUCTURES					300	500
	PROBLEM - COMPOSITE AIRFRAME STRUCTURES WHICH CONSIST OF NUMEROUS PARTS CURED SEPARATELY AND POST BONDED ARE COSTLY. EXCESSIVE COSTS ARE DUE TO HOLDING .002-.008 BOND LINES ON POST BONDED PIECES. MULTIPLE AUTOCLAVE CYCLES AND MANUFACTURING FLOW TIME.						
	SOLUTION - FABRICATE AIRFRAME STRUCTURE AROUND UNITIZED TOOLING CONCEPTS USING THE VACUUM IMPREGNATION PROCESS.						
COMPONENT -- GENERAL							
(7001)	TITLE - MFG TECHNOLOGY FOR AIRFRAME AND SECONDARY STRUCT						100
	PROBLEM - MANUFACTURING PROBLEMS ARISING FROM INSUFFICIENTLY DEVELOPED STATE-OF-THE-ART TECHNOLOGY ARE RESPONSIBLE FOR VARIOUS FAILURES IN PRODUCTION BUY ITEMS.						
	SOLUTION - DEVELOP TECHNOLOGY TO MANUFACTURE AIRFRAME AND SECONDARY STRUCTURES FROM EXISTING NEW METALLIC OR NONMETALLIC MATERIALS AT SUBSTANIALLY LOWER COSTS.						

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- GENERAL (CONTINUED)							
(7302)	TITLE - PROD OF TIB2 COATED LONG LIFE TOOLS						265
	PROBLEM - AIRFRAME COMPOSITE COMPONENTS REQUIRE EXTENSIVE MACHINING WHICH IS EXPENSIVE IN TERMS OF LABOR HOURS REQUIRED AND TOOL COSTS.						
	SOLUTION - MANUFACTURE OF TIB2 COATED TOOLS WILL BE SCALED UP FROM LAB-SIZED ELECTROLYTIC CELLS (15 LBS) TO PRODUCTION SIZE (ABOUT 300 LBS) WITH THE CAPABILITY TO PLATE VARIOUS TOOL TYPES AND SHAPES. TOTAL TOOLING COST WILL BE ABOUT 20 PCT OF CURRENT.						
(7456)	TITLE - LOW COST TOOLING FOR AIRFRAME AND ROTOR COMPONENTS				500	1250	750
	PROBLEM - HIGH COST METAL TOOLING CONCEPTS OR EXPENSIVE AUTOCLAVE CURING APPROCHES HAVE BEEN USED WHICH RESULT IN EXTENDED CURE CYCLES AND POOR ENERGY CONSERVATION.						
	SOLUTION - ESTABLISH TECHNOLOGY FOR THE USE OF SELF-CONTAINED INTEGRALLY HEATED PLATIN PRESS TOOLING. THIS WILL ALLOW COMPOSITE COMPONENTS TO BE FABRICATED AT LOW COST DUE TO RAPID CURE TIME AND PRODUCIBILITY.						
(7475)	TITLE - ONE PART SEALANT FOR WATER INTEGRITY						250
	PROBLEM - CURRENTLY USED TWO PART POLYSULFIDE SEALANTS REQUIRE MIXING/METERING OF BULK CHEMICALS, QUICK FREEZING OF THE MIX, LIMITED FROZEN STORAGE, AND THAWING BEFORE USE. WASTE IS HIGH DUE TO ITS CURE IN THE CONTAINER.						
	SOLUTION - TO QUALIFY A ONE PART POLYURETHANE SEALANT FOR USE IN AIRCRAFT, WHICH CAN ELIMINATE MUCH OF THE EQUIPMENT USED TO PROCESS AND STORE TWO PART SEALANTS. IT CURES ONLY WHEN EXPOSED TO THE ATMOSPHERE, THUS PROVIDING LONG STORAGE LIFE AND MINIMAL WASTE.						
(7478)	TITLE - THIN COMPOSITE LAMINATE CUTTING METHOD - AIRFRAME NON-METAL						235
	PROBLEM - CURRENT CUTTING METHODS CREATE DELAMINATION, CHIPPING, SPLINTERING, AND FUZZING. CUTTING AND FINISHING OF THIN (.035 IN - .100 IN) LAMINATES REQUIRE NEW METHODS TO ELIMINATE THESE PROBLEMS.						
	SOLUTION - EXAMINE CURRENT CUTTING METHODS AND EXPLORE ALTERNATIVE CUTTING TOOLS, METHODS, AND PROCEDURES SUCH AS FLUID JET, LASER, STEEL RULE DIE, AND HIGH SPEED ROUTERS.						
(7502)	TITLE - ISOSTATIC FORGING FOR AH-64 SHOCK STRUT						200
	PROBLEM - TRA IS CURRENTLY PAYING APPROX. 2000 DOLLARS PER SHOCK STRUT FORGING. THE FORGING WEIGHS ABOUT 90 LBS, AFTER MACHINING THE FINISHED PARTS WEIGHT ABOUT 20 LBS. EXTENSIVE MACHINE TIME IS REQUIRED TO PRODUCE NET SURFACES PER ENGINEERING DRAWING.						
	SOLUTION - DEVELOP A HOT PRECISION FORGING DIE THAT WOULD PRODUCE CLOSED TOLERANCE PARTS. THE FINISHED PARTS WILL CONFORM TO NET DIMENSIONS WITHOUT HIGH MACHINING, EXCEPT THE SPINDLE AND THE BASE.						

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- GENERAL (CONTINUED)							
(7503)	TITLE - ROBOTIC RIVETING SYSTEM						400
	PROBLEM - CURRENTLY, MUCH OF THE DRILLING AND RIVETING IN AIRFRAMES IS DONE MANUALLY. SOME OF THIS WORK IS DONE ON SEMI-AUTOMATIC MACHINES, WHICH IS STILL LABOR INTENSIVE. MORE FULLY AUTOMATED MACHINES ARE NOT ECONOMICALLY FEASIBLE DUE TO SMALL BATCH SIZES.						
	SOLUTION - DEVELOP A MULTI-AXIS ROBOT COUPLED TO A VISION RECOGNITION SYSTEM AND A CAD/CAM DATA NETWORK INTO A FLEXIBLE SYSTEM THAT WILL AUTOMATICALLY ACQUIRE, DRILL, RIVET, INSPECT AND STORE A PART WITHOUT HUMAN INTERVENTION.						
(7507)	TITLE - MANUFACTURING FINISH PROCESSES PROCESSING CENTER PLAN					1500	500
	PROBLEM - THE RAPID DEVELOPMENT OF AEROSPACE TECHNOLOGY TODAY DEMANDS AN EXTENSIVE RANGE OF CHEMICAL PROCESSES FOR METALS. EXISTING PROCESS FACILITIES ARE INADEQUATE, RESULTING IN EXTENSIVE MATERIAL HANDLING AND LIMITED CAPACITY.						
	SOLUTION - DEVELOP A SYSTEMATIC LAYOUT WHICH WOULD INCLUDE A COMPLETE INTEGRATED AUTOMATIC SEQUENCE OPERATED THROUGH NUMERICALLY CONTROLLED EQUIPMENT, WHICH WOULD BE PROGRAMMED ACCORDING TO THE MANUFACTURING PLAN.						
COMPONENT -- MISC COMPONENTS							
(7244)	TITLE - LASER CUTTING AND WELDING OF METAL						330
	PROBLEM - TECHNIQUES ARE NEEDED THAT WILL REDUCE CUTTING AND WELDING TIMES ON AIRCRAFT PARTS.						
	SOLUTION - DEVELOP LASER WELDING TO PERMIT RAPID, PRECISE AND STRUCTURALLY SOUND WELDS. DEVELOP LASER CUTTING METHODS TO CUT COMPLEX CORNERS AT HIGH SPEED.						
(7396)	TITLE - INTEGRAL LOW COST FASTENING SYSTEMS FOR RPV						175
	PROBLEM - JOINING OF COMPONENTS IN RPV SYSTEMS IS ACCOMPLISHED BY THE TRADITIONAL SCREW, NUT, AND BOLT METHODS. UTILIZATION OF THESE METHODS ADD HIGH FABRICATION AND ASSEMBLY COST AND WEIGHT TO THE SYSTEM.						
	SOLUTION - THIS PROJECT WILL DEVELOP THE TECHNOLOGY FOR UTILIZATION AND INTEGRATION OF PLASTIC FASTENERS, SNAP LATCHES, AND OTHER LOW COST MANUFACTURE AND ASSEMBLY TECHNIQUES INTO THE PRODUCTION OF RPV SYSTEMS.						
(7500)	TITLE - POWDERED METAL PARTS					275	350
	PROBLEM - MAJOR MANUFACTURING PROBLEM AREAS EXIST IN THE FABRICATION OF COMPONENT HARDWARE, SUCH AS PITCH HOUSINGS AND WEAPONS SYSTEM RECEIVERS. AVAILABILITY IS NORMALLY IN BILLET, REQUIRING COSTLY MACHINE HOGGING OUT OPERATIONS PRIOR TO FINALIZATION OF FORM.						
	SOLUTION - THE P/M ALLOYS ARE MORE READILY ADAPTABLE TO CLOSED DIE, NEAR NET FORGING TECHNIQUES AS OPPOSED TO OPEN DIE, AND QUANTITATIVE MACHINING OPERATIONS NORMAL TO INGOT METAL (I/M) ALLOYS.						

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- SECONDARY STRUCTURES							
(7344)	TITLE - RIM MOLDING OF LOW COST SECONDARY STRUCTURES			175	225		
	PROBLEM - PRESENT METHODS OF FABRICATING AIRCRAFT SECONDARY STRUCTURES (ESPECIALLY ACCESS DOORS) INVOLVE EXCESSIVE LABOR AND EXPENSIVE MATERIALS. STRUCTURES MADE FROM FIBER REINFORCED SANDWICH PANELS AND/OR FORMED SHEET METAL OFTEN REQUIRE COMPLEX ASSEMBLY.						
	SOLUTION - ESTABLISH A PROCESS TO PRODUCE THESE SECONDARY STRUCTURES FROM REACTION INJECTED MOLDED (RIM) URETHANES. RIM IS A LOW PRESSURE MOLDING TECHNIQUE WHICH CAN USE LOW COST COMPOSITE MOLDS TO GIVE EXTREMELY COST EFFECTIVE STRUCTURES.						
(7385)	TITLE - COMPOSITE ENGINE INLET						350
	PROBLEM - MOLDING COMPOSITES TO SHAPES SUCH AS THAT OF THE BLACK HAWK INLET IN PRODUCTION HAS NOT BEEN DEMONSTRATED.						
	SOLUTION - ESTABLISH A PRODUCTION MOLDING PROCESS FOR MANUFACTURING AN INLET COMPOSED OF ALUMINIMIZED GLASS FIBERS IN A POLYAMINE MATRIX.						
(7390)	TITLE - FIBER REINFORCED THERMOPLASTIC STRUCTURE						350
	PROBLEM - HELICOPTER SECONDARY AIRFRAME STRUCTURES ARE EXPENSIVE AND A FREQUENT CAUSE OF DOWNTIME. THE CONTINUAL REPAIR AND REPLACEMENT OF THESE ITEMS IS A MAJOR AIRFRAME OPERATIONAL COST FACTOR.						
	SOLUTION - ESTABLISH A MANUFACTURING METHOD TO INCORPORATE HIGH STRENGTH AND HIGH MODULUS FIBERS INTO THERMOPLASTIC FOR HELICOPTER STRUCTURES.						
(7473)	TITLE - FIBER REINFORCED THERMOPLASTIC STRUCTURES						150
	PROBLEM - CURRENT AIRFRAME SECONDARY STRUCTURES ARE CONSTRUCTED FROM SHEET METAL OR THERMOSETTING COMPOSITES. SHEET METAL CONSTRUCTION REQUIRES MANY DETAIL PARTS AND LABOR, AND THERMOSETTING COMPOSITES REQUIRES EXPENSIVE STORAGE, FORMING AND CURING STEPS.						
	SOLUTION - USE FIBER REINFORCED THERMOPLASTIC COMPOSITE MATERIALS. THEY ARE LESS EXPENSIVE TO STORE AND FORM. THEY ARE ALSO MORE DAMAGE TOLERANT AND EASIER TO REPAIR IN THEIR APPLICATION. KNITTED AND BRAIDED FABRICS WILL BE USED.						
(7519)	TITLE - ADVANCED THERMOPLASTIC COMPOSITES					300	325
	PROBLEM - DUE TO THE DEMAND FOR DURABILITY, MAINTAINABILITY, AND REDUCED WEIGHT IN HELICOPTER STRUCTURES, THESE HIGHLY DESIRABLE COMPOSITES MUST ALSO BE COST EFFECTIVE AND COMPATIBLE WITH HIGH RATE PRODUCTION PROCESSES.						
	SOLUTION - CARBON FILLED PEEK AND LCP RESINS PLUS GRAPHITE REINFORCED (UNIDIRECTIONAL AND WOVEN) PEEK AND LCP CONSOLIDATED SHEET WILL BE CHARACTERIZED WITH RESPECT TO ADVANCED HELICOPTER DESIGN REQUIREMENTS.						

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- SECONDARY STRUCTURES (CONTINUED)							
(7533)	TITLE - FIBER REINFORCED THERMOPLASTIC MATERIALS PRODUCTION					500	200
	PROBLEM - CURRENT PRODUCTION HELICOPTER SECONDARY STRUCTURES, USUALLY MADE FROM SPOT WELDED OR ADHESIVELY BONDED ALUMINUM, ARE EXPENSIVE AND A FREQUENT CAUSE OF AIRCRAFT DOWNTIME, DUE TO CONTINUAL REPAIR AND REPLACEMENT OF THESE ITEMS.						
	SOLUTION - A METHOD OF INCORPORATING HIGH STRENGTH AND HIGH MODULUS FIBERS INTO THERMOPLASTIC RESINS HAS BEEN DEMONSTRATED. THE DEVELOPMENT PHASE MUST NOW BE COMPLETED IN ORDER TO PRODUCE CONSISTENT COMPONENTS AND ACHIEVE A VIABLE FACTORY PRODUCTION PROCESS.						
COMPONENT -- STRUCTURAL MEMBERS							
(7193)	TITLE - ADV FILAMENT WNDG FOR AIRCRAFT COMPONENTS						350
	PROBLEM - CURRENT COMMERCIAL PRACTICES ON FILAMENT WINDING ARE EXPENSIVE.						
	SOLUTION - A NUMBER OF RECENT DEVELOPMENTS IN FILAMENT WINDING TECHNOLOGY ORIGINATING IN THE U.S., DENMARK, AND HUNGARY SHOW PROMISE OF EXPANDING THE FLEXIBILITY OF THE FILAMENT WINDING PROCESS.						
(7373)	TITLE - SAND PUNCH SPF OF TITANIUM						300
	PROBLEM - MANY AIRFRAME PARTS CONSIST OF MULTIPLE DETAILS RIVETED OR SPOT-WELDED TOGETHER THAT INCREASE THE FORMING CYCLE, TOOLING COSTS, AND LABOR. ALSO MANY PART CONTOURS ARE IMPOSSIBLE TO FORM BY CONVENTIONAL METHODS.						
	SOLUTION - THIS PROJECT WILL DEVELOP A 'SAND PUNCH' METHOD OF SUPERPLASTICALLY FORMING TITANIUM ALLOYS AS A PRACTICAL, ECONOMICAL PRODUCTION METHOD.						
(7374)	TITLE - BI-MATRIX CARBON-CARBON STRUCTURAL COMPONENTS						450
	PROBLEM - RECENT ADVANCES IN THE DEVELOPMENT OF LASER WEAPONS HAVE REAPPRAISED THE TIMING FOR THE INTRODUCTION OF LASER TACTICAL WEAPONS.						
	SOLUTION - THIS PROJECT WILL DEVELOP THE MANUFACTURING TECHNOLOGY NECESSARY FOR PRODUCTION AND RETROFIT OF BI-MATRIX CARBON-CARBON STRUCTURAL COMPONENTS. BI-MATRIX C-C IS A HIGH STRENGTH LIGHTWEIGHT INTEGRAL HIGH ENERGY LASER PROTECTIVE BARRIER SYSTEM.						
(7389)	TITLE - SUPERPLASTIC FORMING OF ALUMINIUM COMPONENTS	280	125	745			
	PROBLEM - CURRENT METHODS OF MACHINING ALUMINIUM FORGINGS ARE EXPENSIVE AND REQUIRE AN EXCESSIVE NUMBER OF PARTS.						
	SOLUTION - ESTABLISH FABRICATION TECHNOLOGY NECESSARY TO MANUFACTURE ALUMINUM AIRFRAME COMPONENTS THRU THE APPLICATION OF SUPERPLASTIC FORMING OF ALUM ALLOY SHEET MATERIAL.						

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- STRUCTURAL MEMBERS (CONTINUED)							
(7414)	TITLE - JOINING OF REIN THERMOPLASTIC COMPOSITE STRUCT			225			
	PROBLEM - UTILIZATION OF FIBER REINFORCED THERMOPLASTIC RESIN SYSTEMS TO FORM STRUCTURAL ELEMENTS CURRENTLY ARE JOINED BY ADHESIVE BONDING WHICH TAKES HOURS TO CURE.						
	SOLUTION - USE LOW COST DIRECT MATERIAL JOINING METHODS SUCH AS ULTRASONIC SEAM OR SPOT WELDING, DIRECT THERMAL FUSION, ETC FOR REINFORCED THERMOPLASTIC STRUCTURAL ELEMENTS.						
(7436)	TITLE - HIGH PERFORMANCE METAL MATRIX COMPOSITE STRINGER FORMS						250
	PROBLEM - EPOXY MATRIX COMPOSITES FOR ADVANCED APPLICATIONS HAVE OUTSTANDING MECH PROPERTIES BUT LACK STABILITY IN HIGH TEMP/HUMIDITY ENVIRONMENTS. MANTECH FOR STRINGER FORMS HAS REACHED A MILESTONE ON PILOT SCALE BUT MUST BE SCALED TO AIRFRAME CONFIGURATION.						
	SOLUTION - DEVELOP PROCESS AND TOOLING FOR UNIDIRECTIONAL FORMS OF METAL MATRIX COMPOSITES. THE PROCESS IS CHARACTERIZED BY A SINGLE STEP MODE ACHIEVING CONSOLIDATION, HIGH PERF PROPERTIES, VARIED CROSS SECTION, PRECISE DIMENSIONS AND EXTENDED LENGTH.						
(7493)	TITLE - ASSEMBLY LEVEL JOINING OF LARGE COMPOSITE STRUCTURES					290	
	PROBLEM - ADHESIVELY BONDED STRUCTURAL JOINTS ARE PREFERRED OVER MECHANICAL FASTENERS, YET IN SOME AREAS IT IS NOT POSSIBLE TO USE CONVENTIONAL MEANS OF APPLYING CLAMPING PRESSURE AND HEAT TO THE JOINT, PARTICULARLY IN AREAS OF LIMITED ACCESS.						
	SOLUTION - ADVANCE THE TECHNOLOGY OF ASSEMBLY LEVEL JOINING BY DEVELOPING INTEGRALLY HEATED JOINTS AND UTILIZING SAMARIUM COBALT 'SUPERMAGNETS' TO APPLY BONDING PRESSURE TO LIMITED ACCESS STRUCTURAL JOINTS.						
COMPONENT -- STRUCTURAL PANELS							
(7359)	TITLE - POLYIMIDE FOAM FOR MULTIFUNCTIONAL AIRCRAFT STRUCT						175
	PROBLEM - NOMEX/POLYIMIDE FOAM HAS BEEN DEVELOPED AS A STRUCTURAL CORE FOR MULTIFUNCTIONAL AIRCRAFT SANDWICH STRUCTURES. CHOPPED GLASS AND GRAPHITE ARE INCORPORATED INTO THE FOAM TO GIVE REQUIRED CHARACTERISTICS. PRODUCTION IS HIGH COST WITH LARGE VARIATIONS.						
	SOLUTION - AN AUTOMATED FOAM DISPENSING UNIT WILL BE COMBINED WITH HONEYCOMB FORMING AND SHAPING EQUIPMENT TO FORM CURVED OR COMPLEX SHAPED HONEYCOMB CORE WITH CURED POLYIMIDE FOAM IN PLACE. MICROWAVE, RF, OR FORCED AIR WILL BE USED FOR CURING.						

	FUNDING ($000)					
	PRIOR	83	84	85	86	87
COMPONENT -- STRUCTURAL PANELS (CONTINUED)						
(7395) TITLE - HAND HELD WATER JET CUTTING						150
PROBLEM - CONVENTIONAL METHODS OF CUTTING FLAT AND FORMED COMPOSITE AND NONMETALLIC PANELS RESULTS IN RAPID TOOL WEAR AND HIGH DUST LEVELS. WHEN USED ON KEVLAR FUZZING OF EDGES OCCURS RESULTING IN SECONDARY OPERATIONS.						
SOLUTION - THIS PROJECT WILL DEVELOP A HAND HELD WATER JET CUTTER TO BE USED FOR CUTTING COMPOSITES.						
(7501) TITLE - IMPROVED LOW COST SPF TITANIUM STRUCTURES					375	275
PROBLEM - THE FORMING AND DIFFUSION BONDING PARAMETERS ESTABLISHED FOR THE TITANIUM ALLOYS REQUIRE RELATIVELY HIGH TEMPERATURES. IT IS DESIRED THAT TEMPERATURE OF FABRICATION BE REDUCED IN ORDER TO DERIVE THE BENEFITS OF ADDITIONAL TOOL LIFE, ETC.						
SOLUTION - RECENT ALLOY DEVELOPMENT ACTIVITY HAS RESULTED IN THE DEVELOPMENT OF SECOND GENERATION SUPERPLASTIC TITANIUM ALLOYS CAPABLE OF BEING PROCESSED AT TEMPS. AS LOW AS 150 DEGREES F, WELL BELOW THE 1700 DEGREES F CURRENTLY REQUIRED.						
(7513) TITLE - AUTOMATED COMPACTION OF COMPOSITE LAYUPS						300
PROBLEM - COMPOSITES SUCH AS GRAPHITE/ EPOXY AND KEVLAR/EPOXY REQUIRE MULTIPLE DEBULKING (COMPACTION) DURING FABRICATION. IT HAS BEEN ESTABLISHED THAT THE AVERAGE COMPACTION TIME IS 10-40 PERCENT OF LAYUP TIME, DEPENDING ON CONTOUR SEVERITY.						
SOLUTION - THE TIME CONSUMING AND LABOR INTENSIVE COMPACTION CYCLE SHOULD BE MECHANIZED BY DEVELOPING A PRESSURIZED COMPACTION MODULE THAT WOULD APPLY HEATED FLUID AGAINST A COMPOSITE LAYUP THROUGH A REUSABLE RUBBER BLADDER.						

CATEGORY

AVIONICS

COMPONENT -- GENERAL

(7006) TITLE - MMT MAN TECHNOLOGY FOR AVIONICS						100
PROBLEM - MANUFACTURING PROBLEMS ARISING FROM INSUFFICIENTLY DEVELOPED STATE-OF-THE-ART TECHNOLOGY ARE RESPONSIBLE FOR VARIOUS FAILURES IN THE AVIONICS AREA.						
SOLUTION - DEVELOP TECHNOLOGY TO MANUFACTURE NEW OR IMPROVED TECHNIQUES THAT WILL INCREASE RELIABILITY AND REDUCE LIFE CYCLE COSTS IN THE AVIONICS FIELD.						

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- GENERAL (CONTINUED)							
(7293)	TITLE - MOLDED WAVEGUIDE PARTS FOR ANTENNAS						350
	PROBLEM - PHASED ARRAY ANTENNAS ARE TYPICALLY VERY EXPENSIVE AND HEAVY. THEREFORE, MECHANICALLY SCANNED ANTENNAS HAVE BEEN PREFERRED FOR ARMY AIRBORNE APPLICATIONS. THE ARRAY ANTENNA WAVEGUIDE IS A PRIME CONTRIBUTOR TO WEIGHT AND COST.						
	SOLUTION - USE OF MOLDED EPOXY FIBERGLASS WITH METAL COATING HAS BEEN DEMONSTRATED TO LEND ITSELF TO A FEASIBLE DESIGN OF LIGHT WEIGHT WAVEGUIDE FEED STRUCTURES FOR PHASED ARRAY ANTENNAS.						
(7406)	TITLE - REINFORCED THERMOPLASTIC CONTROLS						225
	PROBLEM - CONVENTIONAL BELLCRANKS ARE CAST WITH BEARINGS AND BUSHINGS INDIVIDUALLY DRILLED AND PRESSED IN. BEARING REPLACEMENT IS A TIME CONSUMING PROCESS AND INCURS THE RISK OF BEARING DAMAGE.						
	SOLUTION - DEVELOP THE PROPER COMBINATION OF MATERIALS AND PROCESSES TO PRODUCE LOW COST INJECTION MOLDED BELLCRANKS HAVING BEARINGS MOLDED IN PLACE.						
(7418)	TITLE - COMPOSITE ELECTRO-OPTICAL SYSTEM(EOS)						800
	PROBLEM - MECHANICAL RIGIDITY, STABILITY, OVERALL WEIGHT, AND COSTS ARE PRINCIPLE AREAS AFFECTING THE UTILITY AND AFFORDABILITY OF A SOPHISTICATED EOS.						
	SOLUTION - A COMPOSITE BASED EOS WILL BE FABRICATED UTILIZING THE RESULTS OBTAINED IN THE SLOS PROGRAM.						
(7525)	TITLE - LASER SOLDERING OF PRINTED WIRING BOARDS					185	150
	PROBLEM - PWB SURFACE MOUNTED COMPONENTS CANNOT BE RELIABLY SOLDERED TO PWBS BY CONVENTIONAL TECHNIQUES SINCE REQUIRED ELEVATED PWB ASSEMBLY TEMPERATURES MAY EXCEED THERMAL TOLERANCE LIMITS OF CERTAIN BOARD MATERIALS.						
	SOLUTION - LASER SOLDERING UTILIZES LOCALIZED APPLICATION OF HEAT VARIABLE IN INTENSITY AND DURATION, FOR HIGH PRECISION, REPRODUCIBLE MICROSOLDERING OF SURFACE MOUNTED COMPONENTS TO PWBS, MINIMIZING THERMAL DAMAGE TO AND EXPANSION OF SURROUNDING BOARD AREA.						
(7526)	TITLE - AUTOMATIC IN-PROCESS FAULT ISOLATION FOR DIGITAL HYBRIDS						325
	PROBLEM - PRESENT METHODS OF AUTOMATIC PROGRAM GENERATION FOR TAD/PNVS HYBRID I.C. TESTING ARE LABOR INTENSIVE. ALSO, HYBRID CONTAINING A HIGH PERCENTAGE OF SEQUENTIAL LOGIC ARE ALMOST IMPOSSIBLE TO FAULT ISOLATE MANUALLY LEADING TO NUMEROUS REWORK CYCLES.						
	SOLUTION - THIS PROBLEM CAN BE RESOLVED THROUGH THE USE OF LASER (LOGIC AUTOMATED STIMULUS AND RESPONSE) TO GENERATE THE TEST PATTERNS FOR A GIVEN HYBRID I.C.						

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- GENERAL (CONTINUED)							
(7532)	TITLE - CHIP CARRIER HYBRID PROGRAM					300	
	PROBLEM - THE COST ADVANTAGES OF HYBRID INTEGRATED CIRCUITS ARE NOT BEING FULLY ACHIEVED ON THE TAD/PNVS PROGRAM. MAJOR SOURCES OF THE HIGH COSTS ARE THE USE OF METAL HERMETIC PACKAGE ENCLOSURES AND THE LACK OF PRESCREENING THE SEMICONDUCTOR COMPONENTS.						
	SOLUTION - A REDUCTION IN HYBRID CIRCUIT COSTS MAY BE OBTAINED BY CHANGING HYBRID ASSEMBLY TECHNOLOGY TO ELIMINATE UNSCREENED COMPONENTS AND METAL PACKAGE.						
COMPONENT -- GUIDANCE SYSTEMS							
(7383)	TITLE - USE OF MOLDED PLASTIC HARDWARE IN TWO AXIS DRY GYROSCOPES			165	300		
	PROBLEM - THE PRIMARY COST DRIVER IN THE MANUFACTURE OF CURRENT INERTIAL GYROSCOPES IS THE MACHINING OF SMALL PRECISION COMPLEX METAL PARTS. THE MACHINED PARTS ARE HIGH COST AND ALSO REPRESENT PRODUCTION LEAD TIME PROBLEMS.						
	SOLUTION - MOLD THE GYROSCOPES FROM CARBON FIBER COMPOSITES.						
(7407)	TITLE - AUTOMATED LASER SOLDERING						330
	PROBLEM - CURRENT TECHNOLOGY UTILIZES REFLOW SOLDER AND WAVE SOLDER TECHNIQUES FOR PRINTED CIRCUIT BOARD ASSEMBLIES. THESE METHODS ARE HIGH COST AND BE UNRELIABLE.						
	SOLUTION - THIS PROBLEM WILL DEVELOP LASER SOLDERING TECHNIQUES FOR ATTACHING COMPONENTS AND INTEGRATED CIRCUITS TO PRINTED CIRCUIT BOARDS.						
(7445)	TITLE - DIGITAL/OPTICAL POSITION TRANSDUCERS						800
	PROBLEM - IN ORDER TO PRODUCE THE DIGITAL/OPTICAL POSITION TRANSDUCERS ECONOMICALLY, WAYS OF MAKING THE FIBER OPTIC DELAY BOBBINS SMALL WITHOUT BREAKAGE DUE TO WINDING AND ENVIRONMENT ARE NEEDED. A FIBER MATERIAL NEEDS TO BE SELECTED FOR PERFORMANCE REQUIRMENT						
	SOLUTION - ESTABLISH THE REQUIRED METHODS AND USE THE PROPER MATERIALS TO MAKE THE TRANSDUCER MORE COMPETITIVE WITH ELECTROMECHANICAL TRANSDUCERS.						
(7524)	TITLE - LOW COST MILLIMETER WAVE COMPONENT PRODUCTION					125	280
	PROBLEM - ACTIVE MMW SEEKERS ARE NEEDED FOR PRECISION GUIDED MUNITIONS TO ACHIEVE INCLEMENT WEATHER FIRE-AND-FORGET OPERATION. HOWEVER, THEY DO NOT COMPARE FAVORABLY WITH EXISTING SEMI-ACTIVE LASER SEEKERS FROM THE STANDPOINT OF WEIGHT, VOLUME, AND COST.						
	SOLUTION - WORK DONE INDICATES THAT INJECTION/TRANSFER MOLDING WITH EXISTING POST HANDLING TECHNIQUES WILL DO MANY OF THE MMW FUNCTIONS AND WILL TRANSLATE TO A SIGNIFICANT LOWERING OF FUNCTION COST.						

CATEGORY
DRIVE SYSTEM

MMT PROGRAM PLAN
RCS DRCMT 126

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- BEARINGS							
(7334)	TITLE - ESTABLISH MANTECH FOR POWDER PROC ROLLING BEARINGS						300
	PROBLEM - LIFE IMPROVEMENTS CONDUCTED ON POWDER PROCESSED AISI M50 STEEL HAVE BEEN OBSERVED WHEN COMPARED TO WROUGHT CONSUMABLE VACUUM ARC REMELTED (CVM) AISI M50 STEEL.						
	SOLUTION - DEVELOP ECONOMICALLY SOUND PRODUCTION PROCEDURES FOR QUALITY ASSURANCE OF THE POWDER, PRESSING AND SINTERING, AND SUBSEQUENT OPERATIONS TO MANUFACTURE FINISHED COMPONENTS. THE COMPONENTS WILL BE PRESSED TO NEAR NET SHAPE.						
(7508)	TITLE - BALLISTIC TOLERANT HELICOPTER BEARINGS					150	100
	PROBLEM - THERE IS A DESIRE TO INCREASE THE BALLISTIC TOLERANCE OF HELICOPTER BEARINGS SO AS TO PROVIDE PROTECTION FROM SMALL AND MEDIUM CALIBRE WEAPONS. FOR EXISTING HELICOPTERS, A RETROFIT IS IMPRACTICAL FOR ENGINE AND GEARBOX ENVELOPES ARE FROZEN.						
	SOLUTION - THE FEASIBILITY OF PRODUCING AN OUTER RACE WITH AN INTEGRAL BALLISTIC RESISTANT SLEEVE WAS DEMONSTRATED. THIS SLEEVE PROVIDES STRUCTURAL SUPPORT TO A THIN BEARING STEEL RACEWAY AND THE TOUGHNESS NEEDED TO RESIST THE BALLISTIC IMPACT.						
COMPONENT -- GEARS							
(7003)	TITLE - MANUFACTURING TECHNOLOGY FOR DRIVE PARTS AND COMP						100
	PROBLEM - MANUFACTURING PROBLEMS ARISING FROM INSUFFICIENTLY DEVELOPED STATE-OF-THE-ART TECHNOLOGY ARE RESPONSIBLE FOR FAILURE IN PRODUCTION BUY ITEMS.						
	SOLUTION - DEVELOP TECHNOLOGY TO MANUFACTURE METALLIC AND NON-METALLIC DRIVE PARTS FROM EXISTING OR NEW MATERIALS TO INCREASE RELIABILITY AND DECREASE LIFE CYCLE COSTS.						
(7155)	TITLE - COST EFFECTIVE MFG METHODS FOR HELICOPTER GEARS	890		325	175		
	PROBLEM - DEMAND IN HELICOPTER OPERATION OF GREATER RELIABILITY OF HIGH PERFORMANCE GEARS AT LOWER COST HAS REQUIRED THAT IMPROVED PROCESSING AND EVALUATION TECHNIQUES BE INSTITUTED.						
	SOLUTION - PROJECT WILL ADDRESS THE TOTAL GEAR MANUFACTURING PROCESS, INTEGRATING AVAILABLE NON-DESTRUCTIVE INSPECTION PROCEDURES AND REPLACING INDIVIDUAL TOOTH GRINDING WITH A COMBINATION OF AUSROLLING AND A FINAL ROTARY TOOTH FINISHING PROCEDURE.						
(7187)	TITLE - POWDER MET GEARS FOR GAS TURBINE ENGINES			400	550	250	
	PROBLEM - PRODUCE GEARS FOR TURBINE ENGINES AT A LOWER COST.						
	SOLUTION - DEVELOP THE MANUFACTURING AND QUALIFICATION FOR THE PRODUCTION OF LIGHTLY STRESSED, LOW TEMPERATURE POWDER METALLURGY GEARS FOR SELECTED NON-CRITICAL APPLICATIONS.						

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- GEARS (CONTINUED)							
(7267)	TITLE - LOW COST GEARS FOR TURBINE ENGINES AND ACC GEARBOX						415
	PROBLEM - CURRENT PRODUCTION METHODS FOR AIRCRAFT GEARS DO NOT TAKE FULL ADVANTAGE OF THE ADVANCED TECHNOLOGICAL PROCESSES AVAILABLE.						
	SOLUTION - DEMONSTRATE THE ECONOMY OF USING ADVANCED TECHNOLOGICAL PROCESSES SUCH AS ORBITAL PRECISION FORGING, LASER OR ELECTRON BEAM HARDENING, ROLL-FORMED GEAR TEETH AND POT BROACHING IN THE MANUFACTURE OF AIRCRAFT GEARS.						
(7298)	TITLE - EVALUATION OF HIGH TEMPERATURE CARBURIZING	490	380	400			
	PROBLEM - GEAR CARBURIZING IS PRESENTLY CARRIED OUT WITH A RELATIVELY SLOW ENDOTHERMIC PROCESS, TYPICALLY AT 1700 DEG F, WHICH REQUIRES SURFACE PROTECTION AGAINST DECARBURIZING DURING THE CYCLE OR A POST HEAT TREAT REMOVAL OF THE DECARBURIZED LAYER.						
	SOLUTION - REDUCE PROCESSING TIME BY INCREASING THE OPERATING CAPACITY.ALSO INVESTIGATE VACUUM CARBURIZING AND HARDING OF VARIOUS GEAR CONFIGURATIONS IN ORDER TO PRODUCE A MORE UNIFORM CARBON PROFILE OF GEAR TEETH.						
(7394)	TITLE - DOUBLE HELICAL GEAR						330
	PROBLEM - THE LIFE LIMITING FAILURE MODE OF AIRCRAFT GEARS IS GEAR TOOTH PITTING OR SPALLING. THE DOUBLE HELICAL GEAR PLANETARY SYSTEM WILL UPGRADE PERFORMANCE OF THE TRANSMISSION.						
	SOLUTION - THIS PROJECT WILL ESTABLISH THE MANUFACTURING PROCESS TO PRODUCE THE ONE- PIECE DOUBLE-HELICAL GEAR PLANETARIES BY SHAPING, SHAVING, HARDENING, AND HONING TO REDUCE TRANSMISSION FAILURE RATES.						
(7399)	TITLE - CARPENTER EX-00053 GEAR STEEL						150
	PROBLEM - THE CURRENT MOST COMMON CARBURIZING GEAR STEEL IS AMS 6265. IT IS USUALLY TEMPERED AT 300-350F AND IS NOT SUITABLE FOR HIGH HOT-HARDNESS APPLICATIONS.						
	SOLUTION - QUALIFY EX-00053 GEAR STEEL(20 PERCENT STRONGER IN BENDING FATIGUE STRENGTH) AS THE NEXT GENERATION CARBURIZING GEAR STEEL BY FABRICATING AND COMPARISON TESTING THE COMMON TYPES OF GEARS MADE ON EX-00053 AND AMS 6265.						
(7405)	TITLE - PLASMA NITRIDING OF HELICOPTER GEARS						350
	PROBLEM - CONVENTIONAL AMMONIA GAS NITRIDING MUST BE PRECEDED BY EXTENSIVE CHEMICAL AND ABRASIVE CLEANING BEFORE EXPOSURE TO THE NITRIDING ATMOSPHERE BECAUSE THE CUTTING TOOL BURNISHED METAL SURFACES RESIST THE PENETRATION OF THE CASE HARDENING NITROGEN.						
	SOLUTION - DEVELOP A PLASMA NITRIDING PROCESS. THE PLASMA IDEALLY BLAST CLEANS THE SURFACE AND PROMPTLY SATURATES THE SURFACE WITH NITROGEN. THE NITROGEN THEN DIFFUSES INTO THE SURFACE.						

		FUNDING ($000)				
	PRIOR	83	84	85	86	87
COMPONENT -- GEARS (CONTINUED)						
(7455) TITLE - HIGH HOT HARDNESS GEAR STEEL PROCESSING REFINEMENT						200
PROBLEM - PROCESSING OF HIGH HOT HARDNESS GEAR STEELS INCLUDES DOUBLE VACUUM MELTING (DVM) TO ACHIEVE AEROSPACE QUALITY STOCK. DVM IS EXPENSIVE AND LEAVES RESIDUAL INCLUSIONS THAT CAN AFFECT SCRAP RATES AND GEAR LIFE.						
SOLUTION - THIS PROJECT WILL APPLY COST EFFECTIVE ELECTROSLAG REMELTING OR ELECTRON BEAM MELTING TECHNIQUES TO REDUCE THE PROCESS COST OF HIGH HOT HARDNESS GEAR FORGINGS.						
(7469) TITLE - NEAR NET SHAPE FORGED SPIRAL BEVEL GEARS				695	805	639
PROBLEM - THE PRESENT METHOD OF MANUFACTURING AIRCRAFT SPIRAL BEVEL GEARS IS BY METAL REMOVAL PROCESSES INVOLVING HIGH LABOR AND MATERIAL COSTS.						
SOLUTION - HOT FORGE A NEAR NET SHAPE GEAR REQUIRING INTERNAL AND TOOTH GRINDING ONLY.						
(7472) TITLE - SURFACE HARDENING GEARS BY LASER			250	450		
PROBLEM - HELICOPTER TYPE GEARS HAVE BEEN SUCCESSFULLY SURFACE HARDENED BY LASER. THE PROCESS NEEDS TO BE PRODUCTIONIZED AND EXPANDED FOR USE ON GEARS SUSCEPTIBLE TO HEAVY LOADS IN ORDER TO OBTAIN HIGHEST COST BENEFITS.						
SOLUTION - LASER TECHNIQUES WILL BE APPLIED TO SURFACE HARDENING OF HEAVILY LOADED GEARS AND DEMONSTRATE BY TEST THE GENERIC APPLICABILITY OF THE TECHNIQUES TO SPUR GEARS. BOTH MANUFACTURING AND QUALITY CONTROL METHODS WILL BE DEMONSTRATED.						
(7509) TITLE - POWDERED METAL GEAR STEELS					400	300
PROBLEM - HELICOPTER GEAR PROD INVOLVES A LARGE AMOUNT OF CHIP REMOVAL TO PRODUCE FINAL GEAR FROM ORIGINAL FORGING IN WHICH UP TO 6/7 OF MATERIAL MAY BE LOST. THUS AN EXPENSIVE INSPECTION IS NECESSARY TO SCREEN THE MATERIAL BEFORE FINAL OPERATIONS.						
SOLUTION - IN ORDER TO EFFECT A MFG COST REDUCTION WITH P/M GEARS LOWER RAW MATERIAL INPUT WEIGHT, ELIMINATION OF FORGING, AND REDUCTION IN MACHINING ARE NECESSARY. THESE REQUIREMENTS DICTATE CONSOLIDATING GEARS TO NEAR NET SHAPE.						
COMPONENT -- GENERAL						
(7324) TITLE - FREEWHEEL SPRING CLUTCH MANUFACTURING PROCESS						250
PROBLEM - WITH THE HIGH OUTPUT SPEED OF TODAY'S ENGINES, THE NEED EXISTS FOR A COST EFFECTIVE FABRICATION PROCESS OF HIGH SPEED OVERRUNNING CLUTCHES TO BE USED IN HELICOPTER TRANSMISSIONS.						
SOLUTION - DEVELOP A PROCESS TO PRODUCE HELICAL SPRINGS WITHOUT THE NEED OF 'START-STOP' HOLES WHICH CREATE AN IMBALANCE AND STRESS CONCENTRATION UTILIZING METAL MACHINING PROCESSES.						

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- GENERAL (CONTINUED)							
(7393)	TITLE - PROD OF COMPOSITE PITCH HOUSING						150
	PROBLEM - CRITICAL DRIVE COMPONENTS SUCH AS THE PITCH HOUSING, A HIGHLY LOADED PART USED IN ROTARY WING AIRCRAFT, ARE DESIGNED AS THE BEST TRADE-OFF CONSIDERING WEIGHT, COST AND DURABILITY.						
	SOLUTION - THE FLEXIBLITY OF COMPOSITE DESIGN, POSITIONING HIGH STRENGTH AND MODULUS FIBERS, ALLOWS PERFORMANCE OPTIMIZATION WITHOUT THE COMPLICATION OF RIBS IN A CASTING AND AT A LOWER COST THAN A PRECISION FORGING.						
(7393)	TITLE - PROD OF COMPOSITE PITCH HOUSING					150	
	PROBLEM - CRITICAL DRIVE COMPONENTS SUCH AS THE PITCH HOUSING, A HIGHLY LOADED PART USED IN ROTARY WING AIRCRAFT, ARE DESIGNED AS THE BEST TRADE-OFF CONSIDERING WEIGHT, COST AND DURABILITY.						
	SOLUTION - THE FLEXIBLITY OF COMPOSITE DESIGN, POSITIONING HIGH STRENGTH AND MODULUS FIBERS, ALLOWS PERFORMANCE OPTIMIZATION WITHOUT THE COMPLICATION OF RIBS IN A CASTING AND AT A LOWER COST THAN A PRECISION FORGING.						
(7510)	TITLE - PRODUCTIONIZED FABRICATION OF OVERRUNNING CLUTCH SPRING					200	300
	PROBLEM - FUTURE TRANSMISSIONS WHICH UTILIZE HIGH SPEED ENGINES WILL EMPLOY ADVANCED DESIGN OVERRUNNING CLUTCH SPRINGS. THE SPRING IS CURRENTLY PRODUCED BY END MILLING TUBING ON A NUMERICALLY CONTROLLED MACHINE.						
	SOLUTION - THREE OF THE METHODS THAT APPEAR ATTRACTIVE FOR REDUCING THE COST OF FABRICATION OF THE SPRING ARE- NUMERICALLY CONTROLLED ECM, NUMERICALLY CONTROLLED EDM, NUMERICALLY CONTROLLED LATHE.						
COMPONENT -- SHAFTS							
(7326)	TITLE - ADAPT OF ELECTRON BEAM WELDING FOR REPAIR SHAFTS						200
	PROBLEM - DURING OVERHAUL OF HELICOPTER TRANSMISSIONS THE PERCENTAGE OF PART REJECTION FOR SPLINE WEAR IS HIGH FOR GEARS WITH SPLINE INTEGRAL SHAFTS.						
	SOLUTION - ESTABLISH THE TOOLING AND INSPECTION PROCEDURES FOR ELECTRON BEAM (EB) WELDING OF COMPLEX GEAR SHAFT/SPLINE ELEMENTS. BY THIS METHOD THE MOST EXPENSIVE ELEMENT (THE GEAR) CAN BE SAVED BY A SINGLE LOW COST WELD OF A NEW SPLINE TO THE GEAR/SHAFT.						
(7511)	TITLE - PRODUCTION OF CH-47 AFT ROTOR DRIVE SHAFTS						500
	PROBLEM - THE EXISTING AFT ROTOR DRIVE SHAFT FOR THE CH-47 IS CURRENTLY FABRICATED OF METAL AND HAS A MOAT OF 1800 HRS. FABRICATION TECHNIQUES ARE AVAILABLE WHICH CAN REDUCE SHAFT WEIGHT AND EXTEND THE MOAT.						
	SOLUTION - A HYBRID-COMPOSITE ROTOR SHAFT HAS BEEN SUCCESSFULLY FABRICATED AND TESTED FOR APPLICATION ON THE COMMERCIAL CHINNOOK. THIS RESULTED IN WEIGHT SAVINGS AND AN INCREASE OF MOAT BY 2.5 TIMES.						

	FUNDING ($000)				
	PRIOR	83	84	85	86	87
COMPONENT -- TRANSMISSION HOUSING						
(7354) TITLE - INTEGRALLY STIFFENED HELICOPTER TRANS CASE						1500
PROBLEM - THE LOW STIFFNESS OF THE CURRENT CH-47 CAST MAGNESIUM ALLOY TRANSMISSION CASE CAUSES EXCESSIVE GEAR WEAR, EXCESSIVE NOISE AND EXCESSIVE VIBRATION.						
SOLUTION - THIS PROJECT WILL ESTABLISH THE MANUFACTURING PROCESS FOR CASTING FIBER REINFORCED, INTEGRALLY STIFFENED CH-47 TRANSMISSION CASES.						
(7378) TITLE - STAINLESS STEEL FABRICATED HOUSING			400	900	600	
PROBLEM - HELICOPTER TRANSMISSION HOUSINGS ARE MADE FROM MAGNESIUM CASTINGS. THEY ARE COSTLY AND HAVE HIGH REPLACEMENT RATES AT OVERHAUL DUE TO CRACKS AND CORROSION.						
SOLUTION - APPLY VARIOUS FABRICATION TECHNIQUES TO VARIOUS MATERIALS SUCH AS STAINLESS STEEL TO PRODUCE A LIGHTER WEIGHT, NON-CORROSIVE, AND LESS COSTLY HOUSING.						
(7384) TITLE - COMPOSITE ENGINE GEARBOX			650	550	400	
PROBLEM - CONVENTIONAL GEAR HOUSINGS CONSISTING OF MAGNESIUM EXHIBIT LOW MODULUS, LOW FATIGUE STRENGTH, AND SUSCEPTABILITY TO CORROSION.						
SOLUTION - ESTABLISH A COST EFFECTIVE FILAMENT WINDING MANUFACTURING METHOD FOR A GRAPHITE FIBER/HIGH TEMPERATURE RESIN COMPOSITE HOUSING.						

CATEGORY
GENERAL

COMPONENT -- ALL

(7362) TITLE - ENG DESIGN HANDBOOK FOR TITANIUM CASTINGS			150			
PROBLEM - NO PROVISION HAS BEEN MADE FOR COLLECTING INFORMATION FROM THE ADVANCING STATE OF THE ART IN CAST TITATIUM ALLOYS.						
SOLUTION - THIS PROJECT WOULD COLLECT INFORMATION FROM PAST AND ONGOING PROJECTS DEALING WITH HIGH QUALITY TITANIUM CASTINGS, CREATE NEW DATA TO FILL TECHNICAL GAPS, AS REQUIRED, AND GENERATE AN ENGINEERING DESIGN HANDBOOK.						

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- ALL	(CONTINUED)						
(7443)	TITLE - ROBOTICS FOR HIGH PRODUCTIVITY FORGINGS			225	430	215	
	PROBLEM - THE NEED FOR INCREASED PRODUCTIVITY COUPLED WITH DECREASED FUNDING DICTATES THAT CURRENT TECHNOLOGY, SUCH AS ROBOTICS, MUST BE UTILIZED FULLY EFFECTIVELY IN THE MANUFACTURING PROCESS. AS FORGING CAPCITY DECREASES PRODUCERS NEED TO IMPROVE METHODS.						
	SOLUTION - AN ADVANCED SYSTEM WOULD INCLUDE A ROBOT AND IMAGE SENSING AND THERMAL VIDEO SUBSYSTEM FOR GATHERING AND PROVIDING INFORMATION TO A MINICOMPUTER. THIS DATA WOULD BE USED TO CONTROL FORM AND HEATING OF THE WORKPIECE.						
COMPONENT -- SAFETY							
(7022)	TITLE - PDN OF POLYPHOSPHAZENE FIRE RESIST HYDRAULIC FLUIDS					220	
	PROBLEM - CURRENT HYDRAULIC FLUIDS THAT MEET REQUIRED PERFORMANCE SPECIFICATIONS ARE FLAMMABLE.						
	SOLUTION - THE DEVELOPMENT OF PHOSPHAZENE FLUIDS DEMONSTRATE THERMAL STABILITY, VISCO-ELASTIC PROPERTIES, AND FIRE RESISTANCE. THIS WOULD INCREASE THE FIRE SAFETY OF ARMY AIRCRAFT.						

CATEGORY
IPIP

COMPONENT -- MISCELLANEOUS							
(7426)	TITLE - AIRCRAFT ELECTRONICS MFG PRODUCTIVITY IMPROVEMENT PROGRAM	110			2500	1000	1500
	PROBLEM - ELECTRONICS MANUFACTURING FACILITIES ARE IN NEED OF MODERNIZATION. AGING FACILITIES, TECHNOLOGY, AND METHODS HAVE RESULTED IN HIGH MANUFACTURING COSTS AND SLOW DELIVERIES.						
	SOLUTION - ANALYZE THE MANUFACTURING FACILITIES OF A SELECTED CONTRACTOR (MARTIN MARIETTA) WITH FOCUS ON PRODUCTIVITY, AUTOMATION, CUST SAVINGS, AND PLANT MODERNIZATION.						
(7427)	TITLE - ATTACK HELICOPTER PRODUCTIVITY IMPROVEMENT (API) PROGRAM		1500		3000	1000	1000
	PROBLEM - THE MANUFACTURING FACILITIES, METHODS, AND PRODUCTION MANAGEMENT SYSTEMS OF PRIME CONTRACTORS ARE NOT IN THE LATEST STATE-OF-THE-ART CONDITION. THIS RESULTS IN HIGH COST AND LATE DELIVERY.						
	SOLUTION - CONTRACTORS FACILITY WILL BE EVALUATED, AND WILL RESULT IN AN INCENTIVE CONTRACTURAL PLAN FOR PLANT MODERNIZATION AND AUTOMATION, COMPUTURIZATION, IMPROVED PRODUCTION PLANNING, CONTROL, HANDLING AND INVENTORY, AND ESTABLISH MIS SYSTEMS.						

		FUNDING ($000)				
	PRIOR	83	84	85	86	87
COMPONENT -- MISCELLANEOUS (CONTINUED)						
(7429) TITLE - IPI PROGRAM - SIKORSKY AIRCRAFT - UH-60 BLACKHAWK				2500	1000	1000
PROBLEM - THE MANUFACTURING FACILITIES, METHODS AND PRODUCTION MANAGEMENT SYSTEMS OF SIKORSKYARE NOT IN THE LATEST STATE-OF-THE-ART CONDITION. THIS RESULTS IN HIGH MANUFACTURING COST, LOWER PRODUCTIVITY AND SLOW DELIVERY.						
SOLUTION - AN INCENTIVE CONTRACTURAL PLAN WILL BE ARRANGED TO HELP THE CONTRACTOR INVES THE MAJOR SHARE OF THE NEEDED CAPITAL TO MODERNIZE AND AUTOMATE THE PRODUCTION FACILITIES AND IMPROVE MANAGEMENT SYSTEMS.						
(7433) TITLE - IPI PROGRAM - BELL HELICOPTER TEXTRON INC - AHIP		1200		3000	1000	1000
PROBLEM - THE MANUFACTURING FACILITIES, METHODS AND PRODUCTION MANAGEMENT SYSTEMS AT BELL HELICOPTER TEXTRON, INC ARE NOT UP TO THE LEVEL IN THE GENERAL AEROSPACE INDUSTRY. THIS RESULTS IN HIGH COST AND SLOW DELIVERY.						
SOLUTION - AN INCENTIVE CONTRACTURAL PLAN WILL BE ARRANGED TO HELP BELL INVEST THE MAJOR SHARE OF THE NEEDED CAPITAL TO BRING ITS MANUFACTURING CAPABILITY UP TO THE STATE-OF-THE-ART IN THE GENERAL AEROSPACE INDUSTRY.						
(7442) TITLE - IPI PROGRAM - BOEING VERTOL INC - CH-47D HELICOPTER				1500	1000	1000
PROBLEM - THE MANUFACTURING FACILITIES, METHODS AND PRODUCTION MANAGEMENT SYSTEMS AT BOEING VERTOL, INC. ARE NOT UP TO THE LEVEL IN THE GENERAL AEROSPACE INDUSTRY. THIS RESULTS IN HIGH COST AND SLOW DELIVERY.						
SOLUTION - AN INCENTIVE CONTRACTURAL PLAN WILL BE ARRANGED TO HELP BOEING INVEST THE MAJOR SHARE OF THE NEEDED CAPTIOL TO BRING ITS MANUFACTURING CAPABILITY UP TO THE STATE-OF-THE-ART IN THE GENERAL AEROSPACE INDUSTRY.						
(7449) TITLE - IPI PROGRAM - LOCKHEED MISSILES + SPACE CO -RPV					1000	1500
PROBLEM - THE MANUFACTURING FACILITIES, METHODS AND PRODUCTION MANAGEMENT SYSTEMS AT LOCKHEED MISSLES AND SPACE CO. ARE NOT UP TO THE STATE-OF-THE-ART LEVEL IN INDUSTRY. THIS WILL RESULT IN HIGHER COSTS AND SLOW DELIVERY.						
SOLUTION - AN INCENTIVE CONTRACTURAL PLAN WILL BE ARRANGED TO HELP LOCKHEED, SUNNYVALE, CA, INVEST THE MAJOR SHARE OF THE NEEDED CAPITAL TO BRING ITS MANUFACTURING CAPABILITY UP TO THE STATE-OF-THE-ART IN THE GENERAL AEROSPACE INDUSTRY.						

CATEGORY
ROTOR SYSTEM

	FUNDING ($000)					
	PRIOR	83	84	85	86	87
COMPONENT -- BLADE						
(7392) TITLE - RADIATION CURE OF ROTOR BLADES						150
PROBLEM - BLADE COATINGS ARE BUILT UP IN MULTI-LAYERS EACH LAYER REQUIRING SOLVENT FLASH-OFF TIME. MAIN ROTOR BLADES CAN CONSUME UP TO 10 MANHOURS FOR COATING OPERATIONS.						
SOLUTION - THIS PROGRAM WOULD PROVIDE THE RADIATION CURABLE COATINGS FORMULATION TEST DATA, ECONOMIC JUSTIFICATION STUDIES AND FACILITY DESIGN CRITERIA FOR THE RADIATION CURE OF ROTOR BLADE COATINGS.						
(7403) TITLE - ELECTRONIC BLADE BALANCE SYSTEM						275
PROBLEM - THE STATIC BALANCING OF ROTOR BLADES USING CURRENT METHODS RESULTS IN A SIGNIFICANT DIRECT LABOR AND ELAPSED TIME EXPENDITURE.						
SOLUTION - DEVELOP A COMPUTER ASSISTED BLADE BALANCE MACHINE WHICH DETERMINES THE AMOUNT AND LOCATION OF CORRECTIVE BALANCE WEIGHT ADDITIONS.						
(7404) TITLE - AUTOMATED CURE CYCLES						275
PROBLEM - PRESENT CURING PROCESSES ARE BASED ON THE PREPREG MANUFACTURERS RECOMMENDED CURE CYCLE DEPENDENT ON A FIXED SCHEDULE OF TEMP AND PRESS VS TIME. THIS IS IMPRACTICAL IN A PRODUCTION ENVIRONMENT.						
SOLUTION - DEVELOP A SYSTEM FOR ELECTRONICALLY MONITORING THE CURE OF ORGANIC LAMINATING RESIN SYSTEMS USING THE CURE AND PRESSURE CONTROL SYSTEM OF THE CURING EQUIPMENT.						
COMPONENT -- BLADE/COMPOSITE STRUCTURES						
(7382) TITLE - LOW COST COMPOSITE MAIN ROTOR BLADE FOR THE UH-60A	3890	446	2235			
PROBLEM - MANUFACTURING TECHNOLOGY FOR COCURING GLASS AND GRAPHITE FILAMENT WOUND MAIN ROTOR BLADES HAS NOT BEEN ESTABLISHED FOR THE PRODUCTION ENVIRONMENT.						
SOLUTION - DEVELOP FILAMENT WINDING TECHNOLOGY FOR FABRICATING D SPARS THROUGH OPTIMIZED WINDING OF WET FILAMENTS.						
(7388) TITLE - MANUFACTURING PROOF TESTING OF COMPOSITE ROTOR BLADES						250
PROBLEM - THERE IS A LACK OF A TECHNIQUE WHICH CAN ADEQUATELY DETERMINE STRUCTURAL INTEGRITY OF COMPOSITE MAIN ROTOR BLADES AT THE CONCLUSION OF THE FABRICATION CYCLE.						
SOLUTION - ESTABLISH AN ACOUSTIC EMISSION TECHNIQUE FOR PROOF TESTING COMPOSITE ROTOR BALDES.						

		FUNDING ($000)				
	PRIOR	83	84	85	86	87
COMPONENT -- BLADE/COMPOSITE STRUCTURES (CONTINUED)						
(7421) TITLE - FILM RESIN IMPREGNATION OF BRAIDED HELICOPTER SPAR SECTION					90	
PROBLEM - THE NATURE OF BRAIDING EQUIPMENT AND THE BRAIDING PROCESS MAKES UNIFORM AND CONTROLLED RESIN IMPREGNATION DIFFICULT.						
SOLUTION - ESTABLISH A PROCESS USING FILM EPOXY RESIN.						
(7467) TITLE - ADVANCED COMPOSITE ROTOR HUB				2000	1220	1400
PROBLEM - A MANUFACTURING TECHNIQUE FOR PRODUCING COMPOSITE ROTOR HUBS HAS NOT BEEN DEMONSTRATED.						
SOLUTION - DEMONSTRATE THE INTEGRATION OF FILAMENT WINDING TECHNIQUES WITH OTHER MANUFACTURING TECHNIQUES REQUIRED TO PRODUCE A STRUCTURALLY EFFICIENT, THICK LAMINATE COMPONENT.						
(7474) TITLE - SINGLE CURE TAIL ROTOR			180	60		
PROBLEM - THE CURRENT METHOD OF CURING COMPOSITE TAIL ROTOR BLADES IS TO PRECURE EACH MAJOR DETAIL SEPARATELY AND THEN BOND THEM TOGETHER AS A FINAL ASSEMBLY. THIS APPROACH IS NECESSARY IN ORDER TO PROVIDE A STABLE ELEMENT FOR FORMING AND HOLDING NOMEX CORE.						
SOLUTION - REPLACE THE NOMEX CORE MATERIAL WITH A MOLDABLE, RIGID, STRUCTURAL FOAM. THE USE OF THIS MATERIAL WILL ENABLE ASSEMBLY OF PREPREGED MAJOR DETAILS IN THE FINAL MOLD AND A SINGLE CURE CYCLE TO COMPLETE THE BLADE.						
(7496) TITLE - INTEGRATED TECHNOLOGY ROTOR					1500	3000
PROBLEM - EXISTING ROTOR BLADES ARE MOUNTED TO THE HUB WITH HINGES AND BEARINGS. COSTLY REPAIRS ARE NECESSARY DUE TO FAILURES IN THE JOINTS CONNECTING THE BLADE TO THE ROTOR HUB.						
SOLUTION - DEVELOP THE TECHNOLOGY NECESSARY FOR THE MANUFACTURE OF A SINGLE PIECE, INTEGRATED ROTOR SYSTEM WITH VARYING STIFFNESS PROPERTIES FOR INCREASED RELIABILITY AND TO REDUCE LIFE CYCLE COSTS.						
COMPONENT -- BLADE/LEADING EDGE						
(7492) TITLE - COLD FORM TITANIUM EROSION CAPS FOR ROTOR BLADE					200	150
PROBLEM - ALL COMPOSITE ROTOR BLADES CURRENTLY IN SERVICE USE 6/4 TITANIUM ALLOY SHEET FOR THE LEADING EDGE RESISTANT NOSE CAP. THE MATERIAL IS EXPENSIVE AND IN SHORT SUPPLY. THE HOT FORMING PROCESS REQUIRES THE EXPENDITURE OF EXCESSIVE ENERGY AND LABOR HOURS.						
SOLUTION - A METHOD OF COLD FORMING A MORE READILY AVAILABLE SHEET MATERIAL HAS BEEN DEMONSTRATED, WHICH IS FAST, ENERGY EFFICIENT AND ELIMINATES THE REQUIREMENT FOR LUBRICANTS AND CHEMICAL DESCALING AND RELATED CHEMICAL PROCESSING.						

	FUNDING ($000)					
	PRIOR	83	84	85	86	87
COMPONENT -- BLADE/SPAR						
(7360) TITLE - EXTRUSION OF PRECISION HOLLOW AIRCRAFT COMPONENTS						250
PROBLEM - SOME HOLLOW COMPONENTS, SUCH AS TITANIUM BLADE SPARS, ARE MANUFACTURED FROM SHEET BY WELDING A TUBE AND HOT FORMING. THIS IS A VERY EXPENSIVE TECHNIQUE.						
SOLUTION - CAD/CAM TECHNIQUES, RECENTLY DEVELOPED FOR EXTRUSION OF SOLID SHAPES, CAN BE APPLIED TO HOLLOWS TO IMPROVE EXTRUSION TOLERANCES AND REDUCE MANUFACTURING COSTS.						
COMPONENT -- HUB						
(7517) TITLE - COMPOSITE HUB PRODUCTION						600
PROBLEM - TO MINIMIZE THE WEIGHT OF A FOUR-ARMED BARREL STRUCTURE MADE OF TITANIUM AND TO OPTIMIZE THE STRUCTURAL INTEGRITY OF THE HUB, THE TITANIUM FORGINGS ARE EXTENSIVELY MACHINED. AS A RESULT, COSTS ARE HIGH, ALONG WITH THE PROBLEM OF AVAILABILITY.						
SOLUTION - THE SOLUTION IS TO REPLACE THE HIGH COST/LONG LEAD TIME TITANIUM HUB WITH A COMPOSITE HUB WITH A SINGLE ELASTOMERIC BEARING PER BLADE.						
(8139) TITLE - COMPOSITE MAIN ROTOR HUB						750
PROBLEM - UNACCEPTABLE SIZE AND WEIGHT PENALTIES ARE INCURRED WHEN CONVENIONTAL METALLIC MATERIALS ARE USED FOR ADVANCED HUB DESIGNS.						
SOLUTION - DEVELOP THE FABRICATION TECHNOLOGY, TOOLING AND AUTOMATED TECHNIQUES NECESSARY TO MANUFACTURE COMPOSITE ROTOR HUBS.						
COMPONENT -- MISC COMPONENTS						
(7004) TITLE - MFG TECHNOLOGY FOR ROTOR ITEMS AND ASSOCIATE COMPS						100
PROBLEM - MANUFACTURING PROBLEMS ARISING FROM INSUFFCIENTLY DEVELOPED STATE-OF-THE-ART TECHNOLOGY ARE RESPONSBLE FOR VARIOUS FAILURES IN PRODUCTION BUY ITEMS.						
SOLUTION - DEVELOP TECHNOLOGY TO MFG ROTOR ITEMS AND ASSOCIATED COMPONENTS FROM EXISTING OR NEW MATERIALS THAT WILL INCREASE RELIABILITY AND REDUCE LIFE CYCLE COSTS.						
(7345) TITLE - IN-PROCESS CONTROL OF RESIN MATRIX CURE						300
PROBLEM - CONVENTIONAL CONTROL OF THE CURE STAGE DURING COMPOSITE HARDWARE MANUFACTURING IS ATTAINED THROUGH MANUAL OR AUTOMATIC CONTROL OF THE AUTOCLAVE/PRESS TEMPERATURE AS A FUNCTION OF TIME. THIS METHOD IGNORES THE CHEMICAL STATE OF THE RESIN DURING CURE.						
SOLUTION - USE IN-PROCESS CONTROL TECHNIQUES CAPABLE OF MONITORING THE RESIN FLOW/CURE BEHAVIOR TO INSURE PRODUCTION OF COMPONENTS HAVING CONSISTENTLY HIGH QUALITY.						

		FUNDING ($000)				
	PRIOR	83	84	85	86	87
COMPONENT -- MISC COMPONENTS (CONTINUED)						
(7481) TITLE - MMT FOR CLEAN CASTINGS - ROTATING COMPONENTS				200	150	

PROBLEM - NON METALIC INCLUSIONS FROM THE MASTER METAL CERAMIC MOLD AND CERAMIC CRUCIBLE CAN SIGNIFICANTLY REDUCE METAL STRENGTH AND INCREASE CASTING COST.

SOLUTION - IMPROVED MELTING TECHNIQUES SUCH AS EB COLD HEARTH REFINING AND USE OF FILTERS WILL BE APPLIED TO MASTER HEAT PRODUCTION TO INCREASE PART INTEGRITY AND REDUCE COST.

CATEGORY
TURBINE ENGINE

COMPONENT -- CERAMIC COMPONENTS						
(7350) TITLE - CERAMIC COMPONENTS FOR TURBINE ENGINES			1650	2660		3070

PROBLEM - METAL BLADES/VANES FOR TURBINE ENGINES ARE HIGH COST, USE CRITICAL MATERIALS, AND HAVE UNACCEPTABLE TEMPERATURE LIMITATIONS. CERAMIC MATERIALS WHICH HAVE BETTER PROPERTIES ARE NOT USED BECAUSE OF NON-REPRODUCABLE PROPERTIES AND SHAPE LIMITATIONS.

SOLUTION - SILICON NITRIDE FORMED BY INJECTION MOLDING AND REACTION BONDING IS SUITABLE FOR VANES, AND SILICON CARBIDE FORMED BY INJECTION MOLDING AND PRESSURELESS SINTERING HAS TEMPERATURE AND PRESSURE CHARACTERISTICS SUITABLE FOR BLADES.

(7400) TITLE - ZIRCONIA SHROUD PRODUCTION SCALE-UP						300

PROBLEM - THE CURRENT TURBINE SHROUD MATERIALS WHICH UTILIZE SOPHISTICATED COOLING SCHEMES REQUIRING ENERGY CONSUMING AIR ARE GENERALLY LIMITED TO APPLICATIONS IN THE 2000 TO 2100 DEGREE F RANGE.

SOLUTION - A THERMALLY SPRAYED ZIRCONIUM OXIDE SHROUD SEAL MEETS THE PERFORMANCE, EFFICIENCY AND COST GOALS OF CURRENT AS WELL AS ADVANCED ENGINES WITH A 2500 DEGREE F TYPE OF SHROUD SYSTEM.

COMPONENT -- COMBUSTOR						
(7377) TITLE - SPF/DB STATIC STRUCTURE FOR TURBINE ENGINES				475	675	

PROBLEM - TITANIUM STATIC COMPONENTS OF TURBINE ENGINES USE FORGINGS OR CASTINGS WELDED TO SHEET STOCK AND MACHINED ALL OVER. THIS PROCESS IS TOO COSTLY AND HAS POOR UTILIZATION OF CRITICAL MATERIAL.

SOLUTION - ADAPT THE SPF/DB TECHNOLOGY TO THE MANUFACTURE OF A TITANIUM STATIC COMPONENT OF A TURBINE ENGINE.

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- COMPRESSOR							
(7434)	TITLE - INJECTION FORGING OF TITANIUM IMPELLERS					235	265
	PROBLEM - AIRCRAFT QUALITY IMPELLERS FOR AUXILIARY POWER UNITS AND MAIN POWER PLANTS ARE PRESENTLY BEING FABRICATED FROM TITANIUM FORGINGS BY LABOR INTENSIVE AND COSTLY OPERATIONS.						
	SOLUTION - ESTABLISH AN INJECTION FORGING PROCESS TO PRODUCE A NEAR NET SHAPE FORGING. THIS PROCESS HAS BEEN USED SUCESSFULLY TO FORGE COMPRESSOR BLADE ROOTS IN TITANIUM, STEEL AND SUPERALLOYS.						
(7485)	TITLE - AXIAL COMPRESSOR ROTORS BY ISOTHERMAL FORGING				400	400	200
	PROBLEM - AXIAL COMPRESSOR ROTORS ARE MACHINED PARTS WHICH START WITH FORGINGS AND REQUIRE SIGNIFICANT MACHINING AND MATERIAL OFFAL COSTS USING SOPHISTICATED NUMERICALLY CONTROLLED EQUIPMENT.						
	SOLUTION - USE ISOTHERMAL FORGING TECHNIQUES TO OBTAIN NEAR NET SHAPE DISKS IN ONE SUPERPLASTIC FORGING OPERATION.						
COMPONENT -- COMPRESSOR/TURBINE DISK							
(7457)	TITLE - APPLICATION OF FINE GRAINED PREFORMS				400	500	
	PROBLEM - INGOT METALLURGY RESULTS IN LARGE GRAIN SIZES AND SEGREGATION/MICROSTRUCTURAL EFFECTS THAT YIELD POOR METAL FLOW AND EXPENSIVE LOW LIFE TOOLING.						
	SOLUTION - ESTABLISH THE PROCESSES FOR GAS TURBINE COMPONENTS FROM FINE-GRAIN INGOT TECHNOLOGY. ISOTHERMAL FORGING TECHNIQUES WILL PRODUCE A FINE-GRAINED, LOW FLOW STRESS PREFORM WITHOUT THE USE OF A POWDER METALLURGY STEP.						
COMPONENT -- GENERAL							
(7002)	TITLE - MFG TECHNOLOGY FOR HI-PERFORMANCE ENGINES AND COMPONENTS						100
	PROBLEM - MANUFACTURING PROBLEMS ARISING FROM INSUFFICIENTLY DEVELOPED STATE-OF-THE-ART TECHNOLOGY ARE RESPONSIBLE FOR FAILURES IN PRODUCTION BUY ITEMS.						
	SOLUTION - DEVELOP TECHNOLOGY TO MANUFACTURE EXISTING OR ANTICIPATED HI-PERFORMANCE ENGINE AND ASSOCIATED COMPONENTS USING CURRENT OR NEW MATERIALS.						
(7248)	TITLE - CLOSED LOOP MACHINING, MID-FRAME						540
	PROBLEM - THE ENGINE MID-FRAME HAS 22 DIAMETERS WITH TOLERANCES RANGING FROM .001 IN. THESE TOLERANCES RESULT IN HIGH MACHINING, REWORK AND INSPECTION COSTS.						
	SOLUTION - DEVELOP CLOSED LOOP MACHINING THAT WILL AUTOMATICALLY COMPENSATE FOR ANY DEVIATION IN NUMERICAL CONTROLLED PROGRAMMED PLAN THEREBY REDUCING PRODUCTION COSTS.						

	FUNDING ($000)					
	PRIOR	83	84	85	86	87
COMPONENT -- GENERAL (CONTINUED)						
(7435) TITLE - IRON BASE ALLOYS BY A RAPID SOLIDIFICATION PROCESS				500	800	
PROBLEM - THE NEED FOR INCREASED PERFORMANCE CAPABILITY OF CURRENT AND NEW TURBINE SYSTEMS DICTATES THAT HIGH TEMPERATURE MATERIALS BE AVAILABLE FOR USE IN COMPONENTS.						
SOLUTION - NEW RAPIDLY SOLIDIFIED IRON-BASE ALLOYS ARE BEING DEVELOPED THAT OFFER IMPROVED PERFORMANCE, LOWER COST AND REDUCED USE OF STRATEGIC MATLS. THIS PROJECT WILL QUALIFY THE PROCESSING TECHNOLOGY AND DEMONSTRATE COST AND PERFORMANCE BENEFITS.						
(7440) TITLE - CAD/CAM FOR THERMAL ENERGY CONSERVATION IN MFG. PROCESS					175	250
PROBLEM - A LARGE SHARE OF THE COST TO MANUFACTURE TURBINE ENGINE COMPONENTS STEMS FROM THE ENERGY USED FOR HEAT TREATING METALS. PARTS ARE OFTEN HEATED LONGER THAN NECESSARY AND ENERGY IS WASTED.						
SOLUTION - ELIMINATE THE ENERGY WASTED DURING HEAT TREATMENT BY USING CAM FOR OPTIMIZATION OF THE VARIOUS HEATING CYCLES.						
(7458) TITLE - CAST T-700 TURBINE CASE					293	339
PROBLEM - CURRENT T-700 PRODUCTION EMPLOYS SHEET METAL AND FORGING OPERATIONS ON INCO 718 AND INCO 903. THIS INVOLVES LABOR INTENSIVE WELDING AND EXTENSIVE MACHINING OF THE FORGED PARTS.						
SOLUTION - FORM THE T-700 CASE FROM A ONE-PIECE INCO 718 NEAR NET SHAPE CASTING. ADVANTAGES INCLUDE A REDUCTION IN MACHINING HOURS AND SUPERIOR CORROSION RESISTANCE.						
(7497) TITLE - MICROWAVE FREQUENCY EDDY CURRENT CRACK DETECTION						325
PROBLEM - CONVENTIONAL SURFACE FLAW DETECTION METHODS LACK SUFFICIENT SENSITIVITY AND RELIABILITY FOR NDE OF IN-SERVICE GAS TURBINE COMPONENTS, PRESENT METHODS ARE UNABLE TO DETECT VERY SMALL, TIGHT FATIGUE CRACKS.						
SOLUTION - THE MICROWAVE FREQUENCY EDDY CURRENT (MIFEC) TECHNIQUE HAS DEMONSTRATED A RELIABLE FLAW DETECTION METHOD FOR RESTRICTIVE GEOMETRIC AREAS IN GAS TURBINE COMPONENTS. MIFEC WILL BE AUTOMATED TO IMPROVE THE OVERALL REPEATABILITY OF THE TECHNIQUE.						

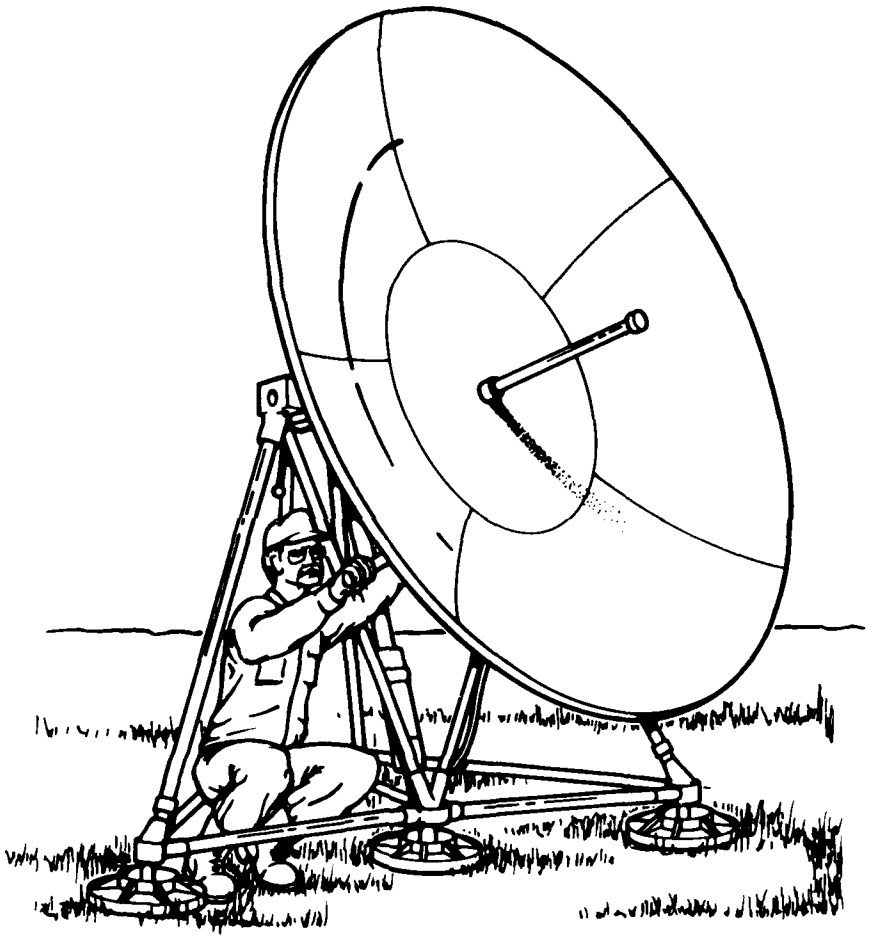
		FUNDING ($000)				
	PRIOR	83	84	85	86	87
COMPONENT -- MISC COMPONENTS						
(7363) TITLE - POWDER PROCESSED NET SHAPE TOOL STEEL ROLLING BEARINGS					300	400
PROBLEM - LIFE IMPROVEMENTS HAVE BEEN OBSERVED IN BEARING TESTS USING POWDER PROCESSED AISI M50 STEEL AND OTHER HIGH ALLOY STEELS WHEN COMPARED TO WROUGHT CONSUMABLE VACUUM ARC REMELTED (CVM) AISI M50 STEEL. IMPROVED PERFORMANCE AND RELIABILITY ARE POSSIBLE.						
SOLUTION - ECONOMICALLY SOUND PRODUCTION PROCEDURES FOR POWDER PROCESSING OF COMPONENTS TO NEAR NET SHAPE AND SUBSEQUENT OPERATIONS TO MANUFACTURE FINISHED COMPONENTS WILL BE DEVELOPED. PRODUCTION AND LIFE CYCLE COSTS ARE EXPECTED TO BE LESS THAN CURRENT.						
(7437) TITLE - PRODUCTION OF CRITICAL HELICOPTER PARTS BY ION NITRIDING					250	300
PROBLEM - GAS NITRIDING IS A CRITICAL PROCESS FOR SUCH PARTS AS CAMS, GEARS AND SPLINES. THIS PROCESS IS COSTLY PRIMARILY BECAUSE OF SMALL PRODUCTION RUNS.						
SOLUTION - ION NITRIDING IS READILY ADAPTABLE TO THE INFREQUENT, SMALL PRODUCTION RUNS COMMONLY ASSOCIATED WITH HELICOPTER MANUFACTURE.						
(7459) TITLE - MMT FOR IMPROVED HIGH TEMPERATURE THIN COATINGS				600	500	
PROBLEM - THE APPLICATION OF IMPROVED HIGH TEMPERATURE THIN COATINGS FOR TURBINE ENGINE AIRFOILS.						
SOLUTION - PURSUE PROCESS AND COMPOSITION MODIFICATIONS OF CURRENT THIN DIFFUSION ALUMINIDE COATINGS. SCALE-UP TO PRODUCTION THE MOST PROMISING COATING SYSTEM.						
(7484) TITLE - TITANIUM ALUMINIDE ENGINE COMPONENTS					300	300
PROBLEM - MANY GAS TURBINE COMPONENTS RESPOND TO MODERATE STRESSES IN THE INTERMEDIATE TEMPERATURE RANGE AND ARE MADE FROM SUPERALLOYS SINCE THIS RANGE IS BEYOND THE USABLE LIMITS OF TITANIUM AND ALUMINUM.						
SOLUTION - TITANIUM ALUMINIDES, WHICH HAVE RECENTLY BEEN EXPLORED AS ENGINE MATERIALS, DEMONSTRATED UNIQUE 800 TO 1600 DEGREE F CAPABILITIES WITH ONE HALF THE DENSITY OF STEEL AND NICKEL BASE SUPERALLOYS.						
COMPONENT -- SEALS						
(7366) TITLE - SPIRAL SELF-ACTING SEAL	370		400	300		
PROBLEM - LABYRINTH SEALS HAVE HIGH LEAKAGE RATES AND CAUSE SIGNIFICANT POWER LOSS. T700 DATA SHOW ENGINE POWER LOSSES OF 2-17 PCT DUE TO THE SEAL LEAKAGE. ACCURACY OF GROOVES AND PARALLELISM OF FACES NEED TO BE DEVELOPED.						
SOLUTION - DEVELOP MAN TECH NECESSARY FOR FABRICATION OF SPIRAL GROOVE SELF ACTING SEALS. R+D HAS DEMONSTRATED THE HIGH-SPEED, LOW-WEAR, AND LOW-LEAKAGE CAPABILITY OF THE SPIRAL SEAL.						

		FUNDING ($000)				
	PRIOR	83	84	85	86	87
COMPONENT -- SEALS (CONTINUED)						
(7410) TITLE - SMALL ENGINE TURBINE SEAL OPTIMIZATION						330
PROBLEM - EFFICIENCIES OF SMALL GAS TURBINES ARE EXTREMELY SENSITIVE TO OPERATING CLEARANCES BETWEEN COMPRESSOR AND BLADE TIPS AND THE STATIONARY SEAL COMPONENTS.						
SOLUTION - THIS PROJECT WILL DEVELOP THE TECHNOLOGY FOR UTILIZING A DUAL DENSITY PLASMA-SPRAYED CERAMIC SEAL. THE CHEMISTRY OF THE COATING WILL BE OPTIMIZED ALONG WITH THE POWDER MANUFACTURING PROCESS.						
COMPONENT -- TURBINE BLADES						
(7356) TITLE - COATINGS FOR UPGRADING PERF. OF GAS TURBINE ALLOYS						115
PROBLEM - THERMAL EXPANSION COEFFICIENT MISMATCH BETWEEN THE BOND AND CERAMIC LAYER RESULTS IN THERMAL STRESS CRACKING WITH SUBSEQUENT SPALLING WITHIN THE CERAMIC OVERLAY. R+D BY PRIVATE INDUSTRY HAS SHOWN THE FEASIBILITY OF THERMAL BARRIER CERAMIC OVERLAYS.						
SOLUTION - ESTABLISH MANUFACTURING TECHNOLOGY FOR PRODUCING IMPROVED COATINGS ON NICKEL BASED SUPERALLOYS. PLASMA SPRAYED TECHNIQUES WILL BE UTILIZED TO OPTIMIZE A NI-CR-AL-Y CERAMIC THERMAL BARRIER OVERLAY BY ADDING AN INTERMEDIATE LAYER ON THE BLADES.						
(7371) TITLE - INTEGRATED BLADE INSPECTION SYSTEM (IBIS)	1170		525			
PROBLEM - INSPECTION OF TURBINE ENGINE BLADES AND VANES NECESSITATES HIGH ACCURACY. THE EFFORT IS TIME CONSUMING AND SUSCEPTABLE TO ERROR.						
SOLUTION - THIS PROJECT WILL IMPROVE THE INFRARED, X-RAY, AND INFRARED THERMOGRAPHY INSPECTION MODULES BY INCREASING RELIABILITY, REPEATABILITY AND SENSITIVITY. ALSO, INSPECTION COSTS WILL BE REDUCES.						
(7416) TITLE - ADVANCED TURBINE AIRFOIL CASTINGS			400	500	200	
PROBLEM - TURBINE AIRFOLS ARE DESIGNED TO A STRESS RUPTURE LIMIT WHETHER COOLED OR UNCOOLED. THIS LIMIT IS LOW DUE TO EQUIAXED CAST SUPERALLOY MATERIALS CURRENTLY USED AND THEIR INHERENT GRAIN BOUNDARY LIMITATIONS.						
SOLUTION - ADVANCED CASTING TECHNIQUES PERMITTING DIRECTIONALLY-ALIGNED GRAIN GROWTH ELIMINATE THE GRAIN BOUNDRIES PERPENDICULAR TO THE STRESSED DIRECTION WHICH INCREASES THE LONGITUDE STRENGTH, CREEP RESISTANCE, AND RUPTURE LIMITS.						
(7471) TITLE - PROCESS CONTROL SYSTEM FOR N/C AND CNC MACHINES			160	340		
PROBLEM - PRESENT PROCESS CONTROL SYSTEMS FOR NC AND CNC MACHINES DO NOT INCLUDE REAL-TIME MONITORING AND FEEDBACK COMPENSATION.						
SOLUTION - DEVELOP A STATISTICAL PROCESS CONTROL SYSTEM CAPABLE OF PERFORMING REAL TIME PROCESS CONTROL ANALYSIS DURING THE MACHINING OPERATION, USING IN-PROCESS GAGING AND AN ADVANCED ELECTRONIC ADAPTIVE CONTROL SYS TO PERFORM QUAL CHECKS DURING MACHINE CYCLE.						

		FUNDING ($000)				
	PRIOR	83	84	85	86	87
COMPONENT -- TURBINE BLADES (CONTINUED)						
(7477) TITLE - UNMANNED MACHINING CELL					225	500
PROBLEM - NUMERICALLY CONTROLLED MACHINE TOOLS ARE UTILIZED IN THE MACHINING OF HIGH TEMPERATURE PARTS FOR GAS TURBINE ENGINES. THE OPERATIONS ARE LABOR INTENSIVE AND VERY COMPLEX, PRESENTING NUMEROUS LOGISTICS AND CONTROL PROBLEMS.						
SOLUTION - ESTABLISH AN UNMANNED MACHINING CELL INCORPORATING ROBOTICS, ADAPTIVE CONTROL, AUTOMATIC GAUGING, AUTOMATED MATERIAL HANDLING, AND NC MACHINE TOOLS IN A SPECIFIC MANUFACTURING AREA.						
COMPONENT -- TURBINE DISKS						
(7361) TITLE - COMPUTER AIDED HIP OF ENGINE DISKS						325
PROBLEM - MOST ENGINE DISKS ARE PRODUCED FROM TITANIUM AND SUPERALLOYS BY FORGING AND MACHINING AT CONSIDERABLE COST. HOT ISOSTATIC PRESSING (HIP) IS AN APPLICABLE NEAR NET SHAPE PROCESS BUT IT REQUIRES EXPENSIVE TRIAL AND ERROR RUNS FOR THE PREFORMS.						
SOLUTION - A COMPUTER-AIDED DESIGN TECHNIQUE WILL BE DEVELOPED FOR ACCURATE DESIGN OF HIP PREFORMS. THIS TECHNIQUE WILL SIMULATE THE SIMULTANEOUS DENSIFICATION AND HEAT TRANSFER DURING A HIP CYCLE. RECENT WORK HAS SHOWN THE FEASIBILITY OF THIS APPROACH.						
(7417) TITLE - LOW COST DISKS BY CAP			300	450	300	
PROBLEM - POWDER METAL DISKS FORM A SIGNIFICANT PART OF THE ENGINE COST DUE TO EXPENSIVE TOOLING/DIE REQUIREMENTS AND HIGH PRESSURE CONSOLIDATION EXPENSE.						
SOLUTION - RECENT DEVELOPMENTS IN CONSOLIDATION BY ATMOSPHERIC PRESSURE HAS SHOWN THAT SUPERALLOY POWDERS CAN BE CONSOLIDATED TO 98 PERCENT DENSITY AT A REDUCED COST. LOWER COST GLASS DIES CAN ALSO BE USED WHICH REDUCES THE COST FURTHER.						
(7453) TITLE - CERAMIC-FREE ATOMIZATION OF SUPERALLOY POWDER				500	550	
PROBLEM - CERAMIC CONTENT IN SUPERALLOY POWDERS USED FOR TURBINE COMPONENTS LIMITS THE BENEFITS OF POWDER METALLURGY. GAS ATOMIZATION REPRESENTS A HIGH VOLUME, LOW COST APPROACH BUT IT HAS NOT PREVENTED CERAMIC ADDITIONS TO THE POWDER.						
SOLUTION - THIS PROJECT WILL EVALUATE SUPERALLOY ATOMIZATION TECHNIQUES, DEMONSTRATE QUANTIFIABLE CERAMIC REDUCTIONS AND IMPROVE GAS TURBINE ENGINE COMPONENT COST AND MATERIAL PERFORMANCE.						

	FUNDING ($000)					
	PRIOR	83	84	85	86	87
COMPONENT -- TURBINE ROTORS						
(7191) TITLE - COST EFFECTIVE PRODUCTION OF COOLED TURBINE ROTORS						440
PROBLEM - PRODUCTION PROCESSES AND QUALITY CONTROL PROCEDURES DO NOT CURRENTLY EXIST FOR AIR-COOLED TURBINE ROTORS.						
SOLUTION - DEVELOP A COST EFFECTIVE PROCEDURE FOR PRODUCING AND ASSURING THE QUALITY OF SINGLE AIR-COOLED ROTORS WHICH CAN DO THE WORK OF TWO STAGES UNDER PRESENT TECHNOLOGY.						
(7300) TITLE - IMPROVED LOW CYCLE FATIGUE CAST ROTORS	608		350			
PROBLEM - INTEGRALLY CAST TURBINE ENGINE ROTORS HAVE BEEN SHOWN TO BE COST EFFECTIVE. HOWEVER, INVESTMENT CASTING RESULTS IN LARGE GRAIN SIZES IN THE DISK REGION AND THIS REDUCES FATIGUE LIFE COMPARED TO WROUGHT MATERIAL.						
SOLUTION - DEFINE CASTING AND HEAT TREAT PARAMETERS, AND FINALIZE THE MANUFACTURING TECHNOLOGY FOR ESTABLISHING FINE-GRAINED CAST ROTOR PRODUCTION UTILIZING GRAIN-REFINEMENT TECHNIQUES.						
(7401) TITLE - CAST IMPELLER AND CLEAN CASTING						685
PROBLEM - INVESTMENT CAST METAL HAS NUMEROUS SOURCES OF NON-METALLIC CONTAMINATION DURING CONVENTIONAL PROCESSING. THE RESULTING INCLUSIONS REDUCE CASTING PROPERTIES OR INCREASE CASTING COST BY REQUIRING WELD REPAIR.						
SOLUTION - THIS PROJECT WILL SEEK TO IDENTIFY AND ELIMINATE THE MAJOR CAUSES OF NON-METALLIC INCLUSIONS IN CASTINGS. THE FINDINGS WILL BE APPLIED TO THE CASTING OF HIGH STRENGTH INCO 718 IMPELLERS AND OTHER CRITICAL COMPONENTS						
(7402) TITLE - CAST INTEGRAL LOW PRESS TURBINE ROTOR						650
PROBLEM - THE CURRENT PRACTICE FOR MFG T700 TURBINES IS TO ATTACH CAST TURBINE BLADES TO A FORGED DISK. EXTENSIVE MACHINING OF THE AIRFOIL AND DISK DOVETAIL JOINTS IS REQD.						
SOLUTION - DEVELOP THE PROCESS FOR INTERGRALLY CAST BLISKS AND PERFORM ENDURANCE TESTING.						
(7408) TITLE - MONO-ROTOR FAB FOR APU APPLICATIONS						220
PROBLEM - THE ROTOR T62T-40 APU COSTS APPROXIMATELY 60 PERCENT OF THE ACQUISITION COST OF THE ENGINE AFTER ASSEMBLY AND BALANCE.						
SOLUTION - THE ROTOR ASSEMBLY FABRICATION METHOD HAS BEEN SIMPLIFIED BY REPLACING THE EXISTING ROTOR BY A SINGLE CASTING AND INERTIA WELDING THIS TO A SHAFT. THIS INTEGRAL MONOROTOR AND SHAFT CAN BE BALANCED IN THE FACTORY PROVIDING A SINGLE LOW-COST COMPONENT.						

	FUNDING ($000)				
	PRIOR	83	84	85	86	87
COMPONENT -- TURBINE ROTORS (CONTINUED)						
(7409) TITLE - IMPROVED CAST TURBINE ROTOR						330
PROBLEM - DIFFICULTIES HAVE BEEN ENCOUNTERED IN CASTING IN792 FOR POWER TURBINE ROTORS AS THE ROTORS ARE SHROUDED AND CONTAIN RELATIVELY LONG SLENDER AIRFOILS ATTACHED TO LARGE HUBS DESPITE THE UTILIZATION OF HIP TECHNIQUES.						
SOLUTION - SELECTED ALLOYS AND PROCESSES WILL BE EVALUATED IN A FULL SCALE ROTOR CONFIGURATION USING IN 792 AS A BASELINE.						
(7411) TITLE - SECOND GENERATION DUAL PROPERTY TRUBINE ROTORS						350
PROBLEM - SECOND GENERATION TURBINE DESIGNS COULD BECOME SIGNIFICANTLY MORE ATTRACTIVE IN COST AND PERFORMANCE BY IMPLEMENTATION OF ADVANCED MATERIALS AND DESIGN CONCEPTS.						
SOLUTION - FABRICATE SECOND GENERATION DISKS BY THE LOWER COST CAP (CONSOLIDATION BY ATMOSPHERIC PRESSURE) TECHNIQUE. MANUFACTURE IMPINGEMENT TUBES BY CASTING THEM AS AN INTRGRAL COMPONENT.						
(7413) TITLE - COOLED RADIAL TURBINE MFG PROCESS						300
PROBLEM - THE PERFORMANCE AND FUEL CONSUMPTION OF GAS TURBINES ARE RELATED TO THE TURBINE INLET TEMP AND THEREFORE TO THE MAX ALLOWABLE METAL TEMP IN THE BLADING. CURRENT PRODUCTION APU EXTENSIVELY EMPLOY UNCOOLED RADIAL TURBINE ROTORS.						
SOLUTION - DEVELOP THE PROCESS FOR MANUFACTURING AN UNCOOLED RADIAL TURBINE ROTOR, CONSISTING OF ADVANCED BLADE MATERIALS BONDED TO A POWDER METAL HUB, CAPABLE OF OPERATING AT AN INLET TEMP SEVERAL HUNDRED DEGREES HIGH THAN NOW POSSIBLE.						
(7480) TITLE - DUAL PROPERTY COMPRESSOR IMPELLER				400	500	300
PROBLEM - CENTRIFUGAL COMPRESSOR BLADES REQUIRE PROPERTIES WHICH CAN NOT BE ECONOMICALLY PRODUCED FROM A SINGLE MATERIAL.						
SOLUTION - THIS PROJECT WILL ESTABLISH A PROCESS WHEREBY TWO DISIMILIAR METALS WILL BE JOINED TOGETHER TO PRODUCE THE DESIRED PROPERTIES.						



COMMUNICATIONS AND ELECTRONICS COMMAND (CECOM)

US ARMY COMMUNICATIONS AND ELECTRONICS COMMAND (CECOM)

The US Army Communications and Electronics Command (CECOM), headquartered at Fort Monmouth, NJ, is responsible for research, development and acquisition of communications, tactical data, and command and control systems for the Army. In addition to logistics, materiel management, engineering, maintenance engineering, and product assurance activities, the command organization includes three technical centers, seven project managers, and one program manager, namely the Center for Tactical Computer Systems (CENTACS); for Communications Systems (CENCOMS) and for Systems Engineering and Integration (CENSEI); the Project Managers for Position Location Reporting System/Tactical Information Distribution System (PLRS/TIDS); Field Artillery Tactical Data Systems (FATDS); Operations Tactical Data Systems (OPTADS); Satellite Communications (SATCOMA); Single Channel Ground & Airborne Radio System (SINCGARS); Multi-Service Communications Systems (MSCS) and Army Tactical Communications Systems (ATACS) and the Program Manager for Test, Measurement, and Diagnostic Equipment (TMDE).

CECOM's planned projects cover a variety of electronics problems with special emphasis on computer applications and circuit technology. Projects support efficient manufacturing of custom components for use in future tactical radios.

Eight projects proposed for FY 85-87 funding will develop advanced methods for production of detector materials needed for night vision devices. Currently, infrared detectors are produced on a small scale under laboratory conditions. Unit costs are high and quality and repeatability are low. Three projects will deal with the processing of the mercury-cadmium-telluride (HgCdTe) raw materials. Three will address methods for cutting and plating the HgCdTe crystals and for depositing electrical contacts on them while another will use chemical vapor deposition techniques to apply HgCdTe onto gallium arsenide wafers. A critical measurement for determining the lifetime of HgCdTe involves a time consuming manual procedure. A project which will apply automated measurement techniques to speed up the lifetime determination is planned for FY 87.

Additional program funding largely anticipates micro-electronics as the driving force in componentry and built-in test capability for command, control, and communications systems. Computer-dominated methodologies are inherent in such areas as design, manufacture, and manufacturing documentation for communications systems and are expected to be of particular value for the short lead time, low volume production anticipated for future equipment and systems.

CECOM

COMMAND FUNDING SUMMARY
(THOUSANDS)

CATEGORY	FY83	FY84	FY85	FY86	FY87
DETECTORS	0	0	450	2350	3775
FREQUENCY CONTROL	0	0	1150	0	0
GENERAL	60	390	500	375	3575
INTEGRATED ELECTRONICS	0	0	750	925	0
IPIP	1054	1222	1000	0	500
OPTICS	0	750	520	0	1500
SOLID STATE	215	261	450	1850	0
TOTAL	1329	2623	4820	5500	9350

CATEGORY
DETECTORS

COMPONENT -- INFRARED

FUNDING ($000)

	PRIOR	83	84	85	86	87
(3114) TITLE - HGCDTE IMPURITIES DETERMINATION					850	
PROBLEM - THE QUALITY OF THE MATERIAL USED TO FABRICATE INFRARED DETECTORS IS NOT KNOWN UNTIL THE DETECTOR IS FABRICATED. THIS CONSUMES MUCH EFFORT AND RESULTS IN AN UNACCEPTABLY LOW YIELD.						
SOLUTION - PERFORM AUTOMATIC ON-LINE ANALYSIS OF MATERIAL IMMEDIATELY PRIOR TO USE.						
(3116) TITLE - AUTOMATED CUTTING OF HGCDTE CRYSTALS					650	
PROBLEM - THE CRYSTALS OF MERCURY CADMIUM TELLURIDE PRESENTLY USED FOR INFRARED DETECTORS ARE VERY SOFT AND DIFFICULT TO CUT ON A PRODUCTION BASIS. THE PROCEDURES USED IN THE SEMICONDUCTOR INDUSTRY DO NOT GIVE AN ACCEPTABLE YIELD.						
SOLUTION - REFINE THE MATERIAL CUTTING TECHNIQUES PRESENTLY USED IN THE AREAS OF CUTTING PRESSURE, SPEED, SHARPNESS, ETC., SO THAT SOFT MATERIAL CAN BE SUCCESSFULLY PROCESSED.						
(3119) TITLE - ELECTRICAL CONTACT FOR HGCDTE CRYSTALS					850	
PROBLEM - DUE TO THE SOFTNESS OF HGCDTE MATERIAL THE DEPOSITION OF ACCEPTABLE ELECTRICAL CONTACTS IS NOT ACCOMPLISHED IN A ROUTINE PRODUCTION MANNER. THIS AREA IS CRITICAL TO SUCCESSFUL FABRICATION OF INFRARED SYSTEMS.						
SOLUTION - ADAPT MATERIAL DEPOSITION TECHNIQUES TO PERMIT THEIR USE ON SOFT SURFACES SO AS NOT TO DESTROY THEM.						
(3121) TITLE - AUTO COMPOUNDING OF HGCDTE						875
PROBLEM - THE EXACT PERCENTAGE OF EACH ELEMENT IN THE COMPOUND HGCDTE MUST BE HELD FOR THE MATERIAL TO OPERATE PROPERLY. AT PRESENT THE COMPOUNDING IS BEING PERFORMED MANUALLY AND THE PERCENTAGE RELATIONSHIP IS NOT ALWAYS ATTAINED.						
SOLUTION - USING AUTOMATIC CONTROLS AND SCALES TO MEASURE AND MIX THE CHEMICALS. THIS WILL RESULT IN A UNIFORM AND REPEATABLE MIXTURE.						
(3122) TITLE - IMPROVED PLATING FOR HGCDTE CRYSTALS						900
PROBLEM - THE SOFTNESS OF THE SURFACE LAYER OF HGCDTE CAUSES PROBLEMS FOR PLATING THE MATERIAL WHEN USING THE USUAL TECHNIQUES.						
SOLUTION - IMPLEMENT NEW TECHNIQUES FOR PLATING SOFT MATERIAL SURFACES.						

	FUNDING ($000)					
	PRIOR	83	84	85	86	87
COMPONENT -- INFRARED (CONTINUED)						
(3123) TITLE - HIGH THROUGHPUT FOR LIFETIME SCANNING OF HGCDTE						1100
PROBLEM - A CRITICAL MEASUREMENT FOR DETERMINING THE ACCEPTABILITY OF HGCDTE MATERIAL IS THE DETERMINATION OF LIFETIME. THIS MEASUREMENT IS TIME CONSUMING WHEN PERFORMED MANUALLY AS IT PRESENTLY IS.						
SOLUTION - USING MEASUREMENT TECHNIQUES SUCH AS HALL EFFECT, SPEEDS UP THE DETERMINATION OF THE MATERIAL LIFETIME AND PERMITS AUTOMATING THE PROCEDURES.						
COMPONENT -- PHOTODETECTORS						
(3101) TITLE - AUTOMATIC PURIFICATION OF TELLURIUM				450		
PROBLEM - PART PER BILLION PURITY OF TELLURIUM IS A LIMITING FACTOR IN ACHIEVEMENT OF HIGH PURITY MERCURY-CADMIUM-TELLURIUM DETECTOR MATERIAL.						
SOLUTION - IMPLEMENT NEW TECHNIQUE FOR DISTILLATION AND SENSITIVE IMPURITY ANALYSIS.						
(3138) TITLE - CHEM VAPOR DESPOSITION OF HGCDTE ON NON-HGCDTE SUBSTRATES						900
PROBLEM - MERCURY CADMIUM TELLURIDE MATERIALS IS HARD TO PRODUCE. SOME IS LIQUID PHASE EPITAXY. ALLOYING TAKES TWO MONTHS AND LPE TAKES 8 HOURS. THE MATERIAL IS USABLE ONLY AT LOWER WAVELENGTHS.						
SOLUTION - APPLY CHEMICAL VAPOR DEPOSITION OF MERCURY-CADMIUM-TELLURIDE MATERIAL ONTO GALLIUM ARSENIDE WAFERS. GROW VERY NARROW LAYERS OF HG-CD-TE ON GA-AS SUBSTRATES. OBTAIN UNIFORM THICKNESS AND A WAVE-FREE SURFACE.						

CATEGORY
FREQUENCY CONTROL

COMPONENT -- OSCILLATORS						
(3048) TITLE - MICROPROCESSOR COMPENSATED CRYSTAL OSCILLATOR				1150		
PROBLEM - LOW POWER TEMPERATURE COMPENSATED CRYSTAL OSCILLATORS WITH STABILITY (1-5X10E-7) SUITABLE FOR USE IN JAM PROOF ARMY RADIOS (SINCGARS) ARE NOT AVAILABLE IN PRODUCTION QUANTITIES.						
SOLUTION - ESTABLISH PRODUCTION CAPABILITY FOR COST EFFECTIVE, LONG LIFE, STABLE TCXO WHICH UTILIZE MICROPROCESSOR FOR TEMPERATURE COMPENSATION FUNCTION.						

CATEGORY
GENERAL

		FUNDING ($000)				
	PRIOR	83	84	85	86	87
COMPONENT -- ELECTRONICS						
(3107) TITLE - REPLACEMENT ELECTRONICS COMPONENTS FOR FIELDED SYSTEMS						2200
PROBLEM - FIELDED SYSTEMS REQUIRE REPLACEMENT OF COMPONENT PARTS WHICH ARE EXPECTED TO BE UNOBTAINABLE FROM ORIGINAL INDUSTRY SOURCES AT FUTURE TIMES BECAUSE OF CHANNELING OF PRODUCTION RESOURCES AND TECHNICAL EXPERTISE TO DIFFERENT PRODUCTS.						
SOLUTION - PROVIDE TECHNOLOGY TO SUPPORT MANUFACTURE OF COMPONENTS NO LONGER OBTAINABLE FROM INDUSTRY.						
COMPONENT -- MISCELLANEOUS						
(3091) TITLE - LIGHTWEIGHT SURVIVABLE ANTENNA FOR ARMOR VEHICLES						575
PROBLEM - THE COST OF THE STANDBY ANTENNA USED ON ARMORED VEHICLES IS EXCESSIVE DUE TO THE EMPLOYMENT OF LOW USAGE, SPECIALIZED STEEL ALLOYS AND THE LONG PROCESSING TIME SUCH MATERIALS REQUIRE.						
SOLUTION - THE CURRENT HEAVY STEEL PLATE ANTENNA WILL BE REPLACED WITH A REINFORCED PLASTIC (COMPOSITE) ANTENNA WITHOUT ALTERING ELECTRICAL PROPERTIES. THE RADIATING MEMBER WLL BE METAL PLATED.						
(9289) TITLE - AUTOTEST OF MICROWAVE DEVICE WAFERS (CAM)		60	390			
PROBLEM - THE NEED TO WAIT UNTIL PACKAGING IS COMPLETE BEFORE TESTING MICROWAVE DEVICES (DIODES, TRANSISTORS) RUNS UP THE COST BECAUSE PACKAGING COST IS APPRECIABLE. BUT TESTING OF DEVVICE CHIPS CANNOT NOW BE DONE.						
SOLUTION - DEVELOP AN AUTOMATED MEASURING SYSTEM FOR EVALUATION THE SEMICON MTL. AT THE WAFER LEVEL, CHECKING EACH DIE AUTOMATICALLY. PERFROM BOTH DC AND RF PROBE MARK UNDER-SPEC DIES. PROVIDE DIAGONISTIC DATA TO PERMIT CHANGING THE PROCESS TO IMPROVE YIELD.						
(9290) TITLE - AUTOMATIC MICROWAVE SEMICONDUCTOR DEVICE TESTING (CAM)				500		
PROBLEM - PRESENT PRODUCTION TESTING METHODS FOR HIGH FREQUENCY DEVICES ARE INADEQUATE. DEVICE CHARACTERIZATION IS SLOW AND EXPENSIVE, AND IS MOSTLY DONE BY HAND. SMALL SIGNAL READINGS CAN BE TAKEN BUT NOT LARGE SIGNAL READINGS.						
SOLUTION - MODIFY AND EXTEND PRESENT AUTOMATIC TEST EQUIPMENT, FIXTURES AND COMPUTER ROUTINES TO NON-DESTRUCTIVELY TEST HIGH FREQUENCY DEVICES, CAPTURE DATA ON DEVICE PARAMETERS AND QUALITY. MODIFY AN AUTOMATIC NETWORK ANALYZER TO DO THIS. USE DATA IN DESIGN						

	FUNDING ($000)					
	PRIOR	83	84	85	86	87
COMPONENT -- PRINTED CIRCUIT BOARD						
(3135) TITLE - SURFACE-MOUNTED COMPONENT BOARD CLEANING PROCESS					375	
PROBLEM - EXISTING METHODS FOR REMOVAL OF SOLDER FLUX AND OTHER CORROSIVE RESIDUES FROM COMPONENT INTERFACE WITH PRINTED CIRCUIT BOARD (PCB) MOUNTING SURFACE ARE INADEQUATE.						
SOLUTION - A NEW CLEANING PROCESS THAT CONCENTRATES LOW FREQUENCY SOLVENT AGITATION TO DISLODGE, DISSOLVE AND REMOVE SOLDERING FLUX AND CORROSIVE ADDITIVES TRAPPED BETWEEN COMPONENTS AND SUBSTRATE WILL BE AUTOMATED AND INTRODUCED INTO PRODUCTION.						
(3137) TITLE - LASER SOLDER/INSPECTION SYSTEM FOR PWB						800
PROBLEM - PRINTED CIRCUIT BOARD COMPONENTS ARE PRESENTLY ATTACHED BY WAVE SOLDERING. LASER TECHNIQUES THAT VAPORIZE THE SOLDER AND THEN AUTOMATICALLY INSPECT THE FORMED JOINT WILL BE DEVELOPED.						
SOLUTION - A PROTOTYPE LASER SOLDERING AND INSPECTION SYSTEM WILL BE CONSTRUCTED. HARDWARE INCLUDING FIXTURES, SCANNER AND CONVEYERS WILL BE PREPARED. SOFTWARE WILL BE DEVELOPED.						

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* CATEGORY *
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*INTEGRATED ELECTRONICS *
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COMPONENT -- CIRCUITRY						
(3111) TITLE - MMT AUTOMATIC MATCHING OF IMPEDANCE				750		
PROBLEM - PRESENT METHODS FOR IMPEDANCE MATCHING ARE LABOR INTENSIVE. TECHNIQUES FOR AUTOMATIC ADJUSTMENT AND MATCHING INTERFACE CIRCUIT IMPEDANCES WILL BE ESTABLISHED.						
SOLUTION - AN AUTOMATIC NETWORK ANALYZER WILL BE USED TO MEASURE CRITICAL IMPEDANCE VALUES. CIRCUIT CORRECTIONS WILL BE PERFORMED BY AUTOMATIC LASER ADJUSTMENT (TRIM) OF LINE WIDTHS, RESISTOR VALUES AND CAPACITOR LEVELS ETC.						
(3113) TITLE - ROBOTIC CONTROL OF WELDING AND COATING					550	
PROBLEM - DUE TO THE SHORT PRODUCTION RUNS NORMALLY ENCOUNTERED BY FABRICATORS OF MILITARY ELECTRONIC EQUIPMENT, THE ADVANTAGE OF A LEARNING CURVE TO INCREASE PRODUCTION YIELD CANNOT BE REALIZED.						
SOLUTION - PROGRAM THE PROCEDURES FOR WELDING OF ENCLOSURES AND COATING OF CIRCUIT ASSEMBLIES AND VERIFY THE ADEQUACY OF THE ROUTINES FOR EACH REPRESENTATIVE DEVICE TYPE. THIS WILL ALLOW THE APPLICATION OF LEARNING CURVE TECHNIQUES TO SHORT PRODUCTION RUNS.						

	FUNDING ($000)				
	PRIOR	83	84	85	86	87
COMPONENT -- CIRCUITRY (CONTINUED)						
(3134) TITLE - HIGH SHOCK RESISTANT IC MOUNTING STRUCTURE					375	

PROBLEM - DIFFERING THERMAL COEFFICIENTS OF EXPANSION (TCE) BETWEEN CHIP CARRIERS AND EPOXY-GLASS OR PORCELAINIZED STEEL SUBSTRATES CAUSE SOLDER JOINT STRESS FAILURES. A NEW COST EFFECTIVE SUBSTRATE IS NEEDED.

SOLUTION - COPPER CLAD INVAR SUBSTRATE MATCHES CHIP CARRIER TCE. A PORCELAINIZING CIRCUIT PROCESS WHERE A 4 TO 6 MIL LAYER OF GLASS FRIT IS DEPOSITED ONTO BOTH SIDES OF A COPPER CLAD INVAR SUBSTRATE AND FIRED WILL BE USED.

CATEGORY
IPIP

COMPONENT -- MISCELLANEOUS						
(3094) TITLE - COMMUNICATIONS TECHNOLOGY TECHMOD FOR JTIDS		1054	1222	1000		

PROBLEM - COMMUNICATIONS EQUIPMENT IS MANUFACTURED USING LABOR INTENSIVE, LOW VOLUME PROCESSES. MACHINES ARE OLD AND UNAUTOMATED. NEW METHODS, PROCESSES AND EQUIPMENT ARE NEEDED.

SOLUTION - USE FLEXIBLE MANUFACTURING TECHNIQUES, COMPUTER AIDED MANUFACTURING, GROUP TECHNOLOGY, COMPUTER CONTROLLED EQUIPMENT, ROBOTS, AND MOTORIZED CONVEYORS. USE AUTOMATIC INSERTION, VAPOR PHASE AND WAVE SOLDERING, AND NUMERICALLY CONTROLLED MACHINING.

(3125) TITLE - INDUSTRIAL PRODUCTIVITY IMPROVEMENT						500

PROBLEM - THE PRESENT MANUFACTURING TECHNIQUES AND PROCEDURES ARE 10 TO 20 YEARS OUT OF DATE WITH PRESENTLY AVAILABLE TECHNOLOGY. THIS IS DUE TO MANY FACTORS.

SOLUTION - DETERMINE THOSE TECHNIQUES AND PROCESSES WHICH OFFER THE GREATEST POSSIBILITY FOR PRODUCTION IMPROVEMENT AND TAKE STEPS TO IMPLEMENT THEM.

CATEGORY
OPTICS

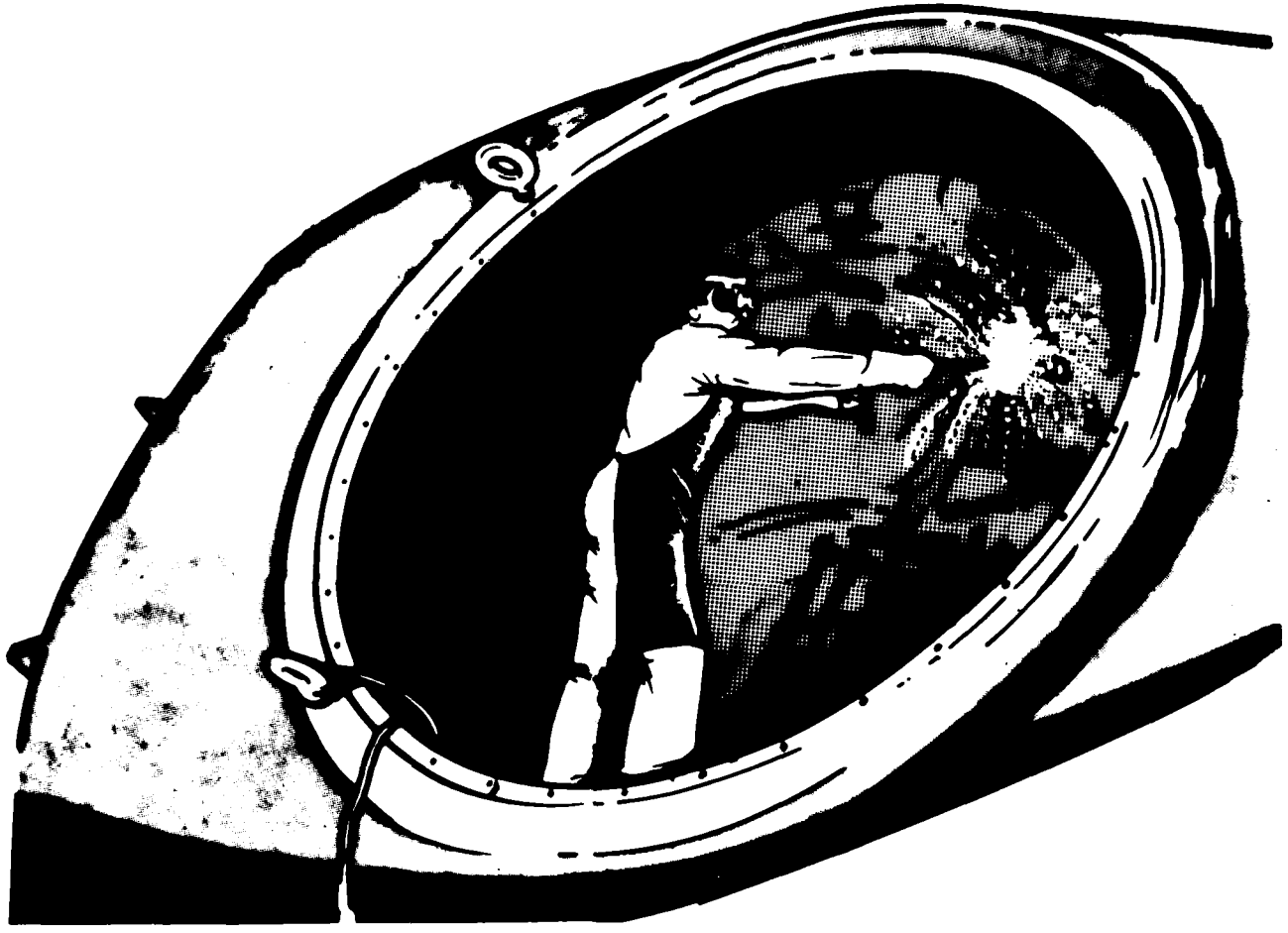
		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- FIBER							
(3090)	TITLE - GAINASP LIGHT EMITTING DIODES				520		
	PROBLEM - THE PRESENT METHOD OF FABRICATION IS LOW VOLUME AND LABOR INTENSIVE. LEDS ADAPTABLE TO MILITARY SYSTEMS ARE AVAILABLE BUT INDUSTRY WILL NOT DEVELOP WITH ITS OWN FUNDS BECAUSE OF LIMITED PRODUCTION PROCUREMENT.						
	SOLUTION - SEMI-AUTOMATIC PROCESSES WILL ADDRESS MOUNTING, CONTACT WIRE ATTACHMENT,PACKAGE ASSEMBLY,ALIGNMENT OF THE FIBER OPTIC AND FINAL ACCEPTANCE TESTING. OTHER AREAS ARE EPITAXY,ETCHING,MASKING,DICING,COATINGS AND SEALING.						
(9784)	TITLE - RUGGEDIZED TACTICAL FIBER OPTIC CABLE ASSEMBLY			750			
	PROBLEM - APPLYING A PROTECTIVE COATING ONTO EACH FIBER HAS NOT BEEN DONE IN PRODUCTION QUANTITIES. BUNDLING THE FIBERS AND APPLYING A PLASTIC SHEATH MUST BE WORKED OUT.						
	SOLUTION - DEVELOP EQUIPMENT TO EXTRUDE A PLASTIC KYNAR COVERING ONTO EACH OPTIC FIBER AND EXTRUDE A PROTECTIVE PLASTIC SHEATH OVER THE CABLE. ESTABLISH TERMINATION METHODS.						
COMPONENT -- MISCELLANEOUS							
(3124)	TITLE - AUTOMATIC OPTICAL MEASUREMENTS						1500
	PROBLEM - MEASUREMENT OF THE PROPERTIES OF OPTICAL MATERIALS IS PERFORMED MANUALLY, A SLOW PROCESS WITH POOR REPEATABILITY OF RESULTS.						
	SOLUTION - AUTOMATE THE MEASUREMENT TECHNIQUE TO GIVE CONSISTANT REPEATABLE RESULTS.						

CATEGORY
SOLID STATE

COMPONENT -- MISCELLANEOUS

(3108)	TITLE - CONTROL OF GAAS BOULE DIAMETER				450		
	PROBLEM - THE MANUAL CONTROL OF LEC GAAS SINGLE CRYSTAL BOULE GROWTH RESULTS IN WIDE BOULE DIAMETER VARIATIONS, WASTED MATERIAL, WASTED UNIFORMITY GRINDING LABOR AND IS A SOURCE OF DEFECTS.						
	SOLUTION - AUTOMATION OF SENSOR READINGS AND CONTROLS SUCH AS TEMPERATURE, PULL RATE AND ROTATION WILL ENABLE DIAMETER VARIATIONS OF LESS THAN + 2MM.						

		FUNDING ($000)				
	PRIOR	83	84	85	86	87
COMPONENT -- MISCELLANEOUS (CONTINUED)						
(3110) TITLE - LASER ANNEALING OF SILICON AND GAAS					400	
PROBLEM - THE SURFACE AREAS OF SEMICONDUCTOR WAFERS HAVE CRYSTAL DEFECTS WHEN SLICED FROM THE BOULE, THESE DEFECTS EFFECT YIELD AND PERFORMANCE OF DEVICES FABRICATED FROM THE WAFERS.						
SOLUTION - USING CRITICAL LEVEL OF LASER POWER AND TIME CORRECT THE CRYSTAL DEFECTS BY A PROCESS THAT CAN BE REFERRED TO AS LOCALIZED ANNEALING.						
(3112) TITLE - WAFER CORRECTION BY ION IMPLANT					600	
PROBLEM - SOME OF THE WAFERS EXTRACTED FROM BOULES OF SILICON AND GALLIUM ARSENIDE ARE DIFICIENT IN IMPURITY IONS CAUSED BY PROBLEMS ENCOUNTERED DURING BOULE GROWTH.						
SOLUTION - USING THE TECHNIQUE OF ION IMPLANT ADD CRITICAL IONS IN IMPURITY DEFICIENT AREAS.						
(3120) TITLE - MILLIMETER WAVE COMPONENTS MANUFACTURE					850	
PROBLEM - THE SMALL SIZE OF MILLIMETER WAVE COMPONENTS REQUIRES THE USE OF SPECIAL HANDLING TOOLS AND FIXTURES PLUS CONNECTORS WHICH ARE NOT READLY AVAILABLE.						
SOLUTION - CREATE A NEW SERIES OF TOOLS AND FIXTURES WHICH ARE USABLE IN A PRODUCTION ATMOSPHERE.						
COMPONENT -- SWITCHES						
(3068) TITLE - INCREASE PRODUCIBILITY OF VARACTORS AND PIN DIODES		215	261			
PROBLEM - PRESENTLY AVAILABLE VARACTORS AND PIN DIODES MADE BY SILICON DIODE TECHNOLOGY ARE EXPENSIVE. THE IR PRODUCTION TECHNIQUES ARE VERY LABOR INTENSIVE, YIELDS ARE LOW, AND UNIFORMITY IS POOR. MATCHING REQUIRES EXTENSIVE TESTING.						
SOLUTION - USE GALLIUM ARSENIDE FOR THESE DEVICES. USE AUTOMATIC CONTROL SYSTEM FOR PROCESSES INSTEAD OF MANUAL PROCEDURES TO INCREASE YIELD. DEPOSIT A MEDIUM TEMPERATURE PASSIVATION LAYER ON PIN DIODES TO IMPROVE RELIABILITY AND UNIFORMITY.						



DEPOT SYSTEMS COMMAND
(DESCOM)

US ARMY DEPOT SYSTEM COMMAND

(DESCOM)

The US Army Depot System Command (DESCOM), with headquarters at Letterkenny Army Depot, Chambersburg, Pennsylvania, commands and controls the twelve depots and seven depot activities in the United States and West Germany which comprise the US Army Depot System. Activated in September 1976, this command employs over 37,500 civilians and nearly 1,400 military personnel and manages as annual budget in excess of $1.5 billion.

DESCOM is a major interface with the soldier in the field. The depots store and ship a broad range of general supplies and munitions managed by the Army Defense Logistics Agency, and other agencies, to US and allied units worldwide. Half of DESCOM's personnel and three-quarters of its budget are dedicated to depot-level maintenance on most of the equipment in the Army's inventory.

DESCOM's planned projects span repair and overhaul operations for tracked/wheeled vehicles and communications systems.

The vehicle related projects include robotics applications which will reduce personnel exposure to hazardous cleaning and refinishing operations, and will improve repair procedures which are time consuming or labor intensive. Significant efforts are directed to the overhaul of track pads and shoes. These include an automated system for the disassembly of double pin track, and injection molding and curing processes for replacement pads.

In the communications/electronics area, DESCOM will conduct a project to refinish electronics shelters.

DESCOM

COMMAND FUNDING SUMMARY
(THOUSANDS)

CATEGORY	FY83	FY84	FY85	FY86	FY87
ARMOR	350	500	0	0	0
BODY/FRAME	0	0	550	681	225
DRIVE SYSTEM	505	525	730	1636	1204
GENERAL	50	370	99	600	200
IPIP	0	3200	2200	0	0
SUSPENSION SYSTEM	0	0	0	0	550
TRACK	341	260	200	341	0
TOTAL	1246	4855	3779	3258	2179

CATEGORY		FUNDING ($000)					
		PRIOR	83	84	85	86	87
ARMOR							
COMPONENT -- HULL/BODY							
(2001)	TITLE - PROVIDE PROTOTYPE ROBOTS FOR AUTOMATED BLAST CLEANING	162	350	500			
	PROBLEM - HULLS OF VEHICLES ARE BLAST CLEANED TO REMOVE OLD PAINT AND RUST PRIOR TO PAINTING. THE CURRENT METHOD IS MANUAL. LABOR INTENSIVE, TIME CONSUMING, AND CREATES AN UNHEALTHY SITUATION FOR THE WORKERS.						
	SOLUTION - A FASTER, MORE PRODUCTIVE, AND MORE PRECISE BLAST CLEANING OPERATION WILL BE DEVELOPED USING INDUSTRIAL ROBOTS. A ROBOT SYSTEM USING THREE ROBOTS CONCURRENTLY WILL BE DESIGNED, INSTALLED, DEBUGGED, AND PROVEN OUT.						
CATEGORY							
BODY/FRAME							
COMPONENT -- COATING							
(4006)	TITLE - ROBOTIC POLYURETHANE CAMOUFLAGE PAINTING					325	225
	PROBLEM - CURRENTLY RRAD DOES NOT UTILIZE AUTOMATED ROBOTIC PAINTING CAMOUFLAGE PAINTING TECHNOLOGY.						
	SOLUTION - PROCURE A ROBOTIC PAINTING SYSTEM COMPLETE WITH A PAINT BOOTH, INFRA-RED TUNNEL, PAINT SYSTEM, TOW CONVEYOR, AND 3 EA. PROGRAMMABLE ROBOTS.						
(7002)	TITLE - ROBOTIC POLYURETHANE CAMOUFLAGE PAINTING OF TWV				550	356	
	PROBLEM - THE CURRENT METHODS OF CAMOUFLAGE PAINTING TACTICAL WHEELED VEHICLES ARE NOT ADEQUATE, AND THE PROCESS IS HAZARDOUS TO PERSONNEL. AT TEAD THE WORKLOAD IS EXPECTED TO INCREASE CAUSING A NEED FOR A MORE EFFICIENT SYSTEM.						
	SOLUTION - THIS PROJECT WILL DEVELOP A ROBOTIC POLYURETHANE PAINT SYSTEM. THE FY85 FUNDS WILL PROCURE THREE PROGRAMMABLE ROBOTS AND THE POLYURETHANE PAINTING SYSTEM. THE FY86 FUNDING WILL PROCURE THE REMAINING EQUIPMENT AND OTHER RELATED SOFTWARE.						
CATEGORY							
DRIVE SYSTEM							

	FUNDING ($000)				
	PRIOR	83	84	85	86	87
COMPONENT -- ENGINE						
(3001) TITLE - POWER AND INERTIA SIMULATOR (PAISI) COMBAT VEHICLE TESTING					1396	1204
PROBLEM - THE TEST TRACK AT THE MAINZ ARMY DEPOT IS A PRIMARY BOTTLENECK IN THE REBUILD MISSION. ALTHOUGH THE TEST TRACK IS OVERLOADED AN INCREASE IN THE WORKLOAD IS PROJECTED.						
SOLUTION - A POWER AND INERTIA SIMULATOR FOR TESTING COMBAT VEHICLES WILL BE DESIGNED AND FABRICATED.						
(7001) TITLE - AUTOMATED DYNAMOMETER CONTROL FOR STANDARDIZED INSP TESTING		505	525			
PROBLEM - ALL ENGINES ARE TORN DOWN WHILE 20% COULD BE RESTORED TO OPERATION WITHOUT PHYSICAL TEARDOWN. TEARDOWN IS 1/3 COST OF OVERHAUL. ALL ENGINES REBUILT REQUIRE A 4 HOUR DYNAMOMETER OPERATIONAL TEST CYCLE.						
SOLUTION - AUTOMATE CURRENT MANUALLY OPERATED DYNAMOMETER TEST CELLS ALLOWING PRESHOP INSPECTION WITHOUT TEARDOWN AND REDUCING REBUILT ENGINE RUN-IN TIME BY EIGHTY PERCENT.						
(7004) TITLE - AUTOMATED ENGINE BLOCK MACHINING				730	240	
PROBLEM - THE CURRENT METHOD OF MACHINING AND INSPECTING ENGINE BLOCKS IS SLOW AND LABOR INTENSIVE. BORING BARS ARE SET UP FOR EACH HOLE TO BE MACHINED AND ALL INSPECTION IS DONE BY HAND.						
SOLUTION - ESTABLISH A MACHINING CENTER FOR THE REWORK OF VARIOUS SIZED ENGINE BLOCKS, INCORPORATING AUTOMATED TOOL CHANGING, INSPECTION, AND DOCUMENTATION. MACHINE CONTROL SOFTWARE WILL BE DEVELOPED FOR INDIVIDUAL BLOCK SIZES.						

CATEGORY
GENERAL

COMPONENT -- MISCELLANEOUS

(0002) TITLE - CAM APPLICATION OF ROBOTICS TO SHELTER REFINISHING		50	370			
PROBLEM - SPRAY PAINTING AND SANDING OF ALUM SKINNED MILITARY CONTAINERS IS LABOR INTENSIVE AND CREATES A HARSH WORKING ENVIRONMENT. DEVICES TO SENSE PRESENCE AND ABSENCE OF PAINT + TO CONTROL HEAT BUILD-UP TO PREVENT ALUM SKIN DELAMINATION ARE NEEDED.						
SOLUTION - DEVELOP A ROBOT EQUIPMENT SPECIFICATON AND DESIGN WITH NECESSARY FEEDBACK MECHANISMS.						

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- MISCELLANEOUS (CONTINUED)							
(0050)	TITLE - PORTABILITY OF DATA ACROSS ALL CAD/CAM RESOURCES					300	200
	PROBLEM - THE ORGANIC MAINTENANCE FACILITIES IN DESCOM HAVE SEVEN CAD/CAM SYSTEMS FROM THREE DIFFERENT VENDORS. THESE SYSTEMS DO NOT HAVE THE CAPABILITY TO EXCHANGE PART GEOMETRY DATA BASE INFORMATION.						
	SOLUTION - IMPLEMENTATION PLAN FOR THE INITIAL GRAPHICS EXCHANGE SPECIFICATION WILL BE ESTABLISHED FOR DESCOM. SPECIFICATION REQUIREMENTS AND OPERATING PROCEDURES WILL BE DEVELOPED FOR IGES TRANSLATORS.						
(2004)	TITLE - PROTOTYPE ROBOT AUGMENTED COMPUTERIZED LASER GRAPHICS ENGRAV				99	300	
	PROBLEM - ENGRAVING IS MANUAL, TEDIOUS AND IS RESTRICTIVE TO PROCESSING A FINITE RANGE OF MATERIALS. SCRAP GENERATION IS HIGH AND PART QUALITY IS LOW. INSTRUMENTATION PANELS, NOMENCLATURE PLATES, CONTROL KNOBS, AND IDENTIFICATION PLATES ARE THE WORKPIECE MIX.						
	SOLUTION - DETERMINE SYSTEM DESIGN CRITERIA AND DEVELOP PROTOTYPE SYSTEM COMBINING LASER ENGRAVING, GRAPHICS AND A ROBOT.						

CATEGORY
IPIP

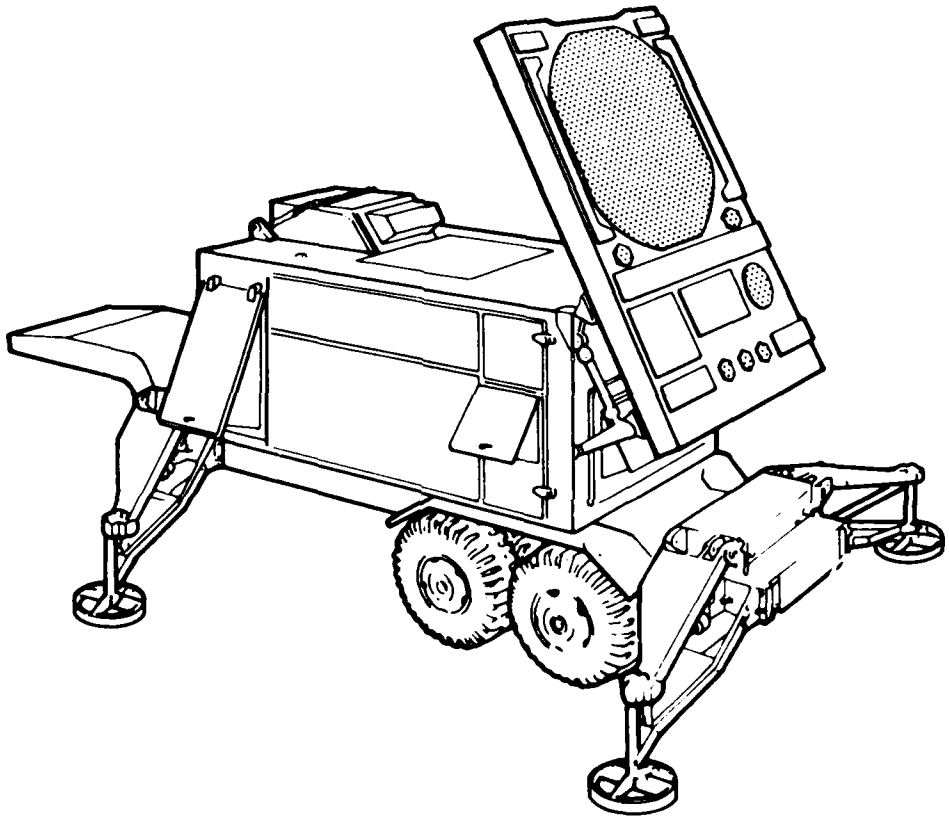
COMPONENT -- MISCELLANEOUS							
(2002)	TITLE - LONG RANGE DEPOT PRODUCTIVITY IMPROVEMENT PROGRAM - LEAD			1700	700		
	PROBLEM - THE LACK OF UP-TO-DATE MANUFACTURING AND PROCESSING TECHNOLOGY HAS RESULTED IN HIGHER OVERHAUL/REBUILD COSTS AND ALSO IN LIMITATIONS TO BOTH PRESENT AND FUTURE MISSION NEEDS THROUGHOUT THE DEPOT.						
	SOLUTION - UPDATE THE DEPOT WITH THE LATEST STATE-OF-THE-ART EQUIPMENT AND PROCESS TECHNOLOGY AVAILABLE TO SUPPORT THE PRESENT AND FUTURE WORKLOADS AND MISSIONS.						
(8001)	TITLE - ANNISTON PRODUCTIVITY IMPROVEMENT PROGRAM (PHASE I)	100		1500	1500		
	PROBLEM - PRODUCTION AND STORAGE FACILITIES ARE OLD,CROWDED,AND/OR FUNCTIONALLY UNSUITED FOR THE ACTIVITIES HOUSED, TOOLS AND EQUIPMENT ARE ON THE AVERAGE 25 YEARS BEHIND THE STATE-OF-THE-ART.						
	SOLUTION - ANALYZE ANADS PRODUCTION OPERATIONS IN TERMS OF PRODUCTIVITY.						

CATEGORY
SUSPENSION SYSTEM

		FUNDING ($000)				
	PRIOR	83	84	85	86	87
COMPONENT -- ROAD WHEELS						
(4008) TITLE - RUBBER INJECTION MOLDING OF ROADWHEELS						550
PROBLEM - ROADWHEELS OF TRACKED VEHICLES ARE CURRENTLY BEING REBUILT USING WWII TECHNOLOGY TO BOND RAW RUBBER TO THE ROADWHEEL. THEN IT MUST BE CURED IN A STEAM MOLD PRESS FOR A FULL HOUR. A NUMBER OF MOLDS ARE REQUIRED AND EXCESS RUBBER MUST BE TRIMMED.						
SOLUTION - PROCURE A SHUTTLE INJECTION ROTARY MOLD MACHINE WITH A CAPABILITY OF CURING THE ROADWHEEL IN 20 MIN OR LESS WITH LITTLE OR NO EXCESS RUBBER TO TRIM OFF. IN FY85 PROCURE A ROBOT TO OPEN THE MOLDS, LOAD AND UNLOAD AT EITHER END OF THE SHUTTLE POSITION.						

CATEGORY
TRACK

COMPONENT -- RUBBER PADS						
(4003) TITLE - RUBBER INJECTION MOLDING OF DOUBLE PIN TRACK				200	341	
PROBLEM - REBUILD OF TRACK BLOCKS IS CURRENTLY BEING ACCOMPLISHED USING 1940S TECHNOLOGY TO BOND RAW RUBBER TO THE STEEL BASE COMPONENT AND THEN CURING THE TRACK BLOCK BETWEEN STEAM PLATENS FOR 2 HOURS.						
SOLUTION - ESTABLISH AN AUTOMATED (ROBOT) INJECTION MOLDING PROCESS THAT WILL CURE THE RUBBER TRACK PAD ON THE TRACK SHOE IN TEN MINUTES OR LESS.						
COMPONENT -- SHOES						
(4004) TITLE - AUTOMATED DISASSEMBLY OF DOUBLE PIN TRACK	299	341	260			
PROBLEM - DISASSEMBLY OF DOUBLE PIN TRACK SHOE SET ASSEMBLIES IS CURRENTLY LABOR INTENSIVE USING MANUAL HAND TOOLS RESULTING IN LOW PRODUCTIVITY.						
SOLUTION - ESTABLISH AN AUTOMATED DISASSEMBLY PROCESS FOR DOUBLE PIN TRACK SHOE ASSEMBLIES.						



ELECTRONICS RESEARCH AND DEVELOPMENT COMMAND (ERADCOM)

US ARMY ELECTRONICS RESEARCH AND DEVELOPMENT COMMAND

(ERADCOM)

ERADCOM is the Army's focal point for electronics research, development and acquisition (RDA) activities, and maintains programs in such areas as electronics signal intelligence, electronic warfare, atmospheric sciences, target acquisitions and combat surveillance, electronic fuzing, radars, sensors, night vision, radar frequency and optical devices, nuclear weapons effects, instrumentation and simulation, and fluidics.

Seven laboratories are integrated into ERADCOM's structure. These laboratories are product oriented and as a result can identify major problem areas where applied MMT efforts can provide important benefits. Although ERADCOM and its laboratories identify and manage projects, the bulk of the actual work is contracted out to industry.

In the category of integrated electronics, ERADCOM will pursue the establishment of various technologies for Very High Speed Integrated Circuits (VHSIC). These projects include three dimensional microelectronic interconnection techniques; in-process screening and control methods; fabrication methods for low cost, stable, and durable X-ray masks and mask membranes; monolithic fabrication of a broadband balanced mixer on a gallium arsenide substrate, a process to improve the productivity of ceramic packages; and an interconnection method for microelectronic packages.

Improving sighting capabilities is an area of prime concern to all the Services. Several projects for significant improvements in production techniques for image intensifiers are included in the Plan. The development of millimeter wave and infrared laser systems for all-weather and smoke fighting is being pursued. This will require the development of new sensors for control systems. Improved techniques will be needed to insure the quality and quantity of such systems. Projects are also included that deal with thermal optical systems. These include the present generation Common Modules and future second generation systems such as the ATAC and MISTAF FLIRS (Forward Looking Infrared Systems) and the Thermal Weapon Sight (TWS).

ERADCOM

COMMAND FUNDING SUMMARY
(THOUSANDS)

CATEGORY	FY83	FY84	FY85	FY86	FY87
DETECTORS	2222	7280	1710	3045	3375
ELECTRON TUBES	1058	1182	475	0	0
FREQUENCY CONTROL	0	0	0	300	460
GENERAL	205	974	0	375	0
GUIDANCE SYSTEM	0	0	0	600	1480
INTEGRATED ELECTRONICS	600	575	3638	3005	1040
IPIP	893	1500	0	0	0
LASER	0	0	690	360	0
OPTICS	0	165	0	0	0
PASSIVE COMPONENTS	408	0	700	600	200
POWER SOURCES	45	803	0	1120	0
SOLID STATE	513	422	1800	2150	1490
TOTAL	5944	12901	9013	11555	8045

CATEGORY: DETECTORS

	FUNDING ($000)				
PRIOR	83	84	85	86	87

COMPONENT -- ARRAYS

(5057) TITLE - 3-5 MICRON TE COOLED FOCAL PLANE MODULES — 410 100 1120

PROBLEM - IMPROVED THERMAL IMAGING EQUIPMENT OPERATING AT 3-5 MICRONS REQUIRE USE OF HIGH DENSITY MATRIX DETECTOR ARRAY IN THE ORDER OF 2000 ELEMENTS. THIS EQUIPMENT CAN'T BE PRODUCED WITH TODAY'S THERMAL IMAGING OFF-FOCAL-PLANE ARRAY TECHNOLOGY.

SOLUTION - INITIATE A PHASED PROGRAM TO ESTABLISH CONTROLLED MANUFACTURING PROCESSES AND TEST METHODS TO PRODUCE INTEGRATED FOCAL PLANE ARRAY COOLER/DEWAR MODULES TO OPERATE AT 195 K. ESTABLISH AND VALIDATE PRODUCTION AND TEST METHODS FOR COMPLETED MODULE.

(5063) TITLE - VACUUM DEWARS FOR MOSAIC ARRAYS FOR 2ND GEN. FLIR — 300 430

PROBLEM - NEW DEWAR CONCEPTS MUST BE ESTABLISHED TO HOUSE THE NEW GENERATION FOCAL PLANE ARRAYS SUCH THAT VACUUM INTEGRITY AND MECHANICAL STABILITY ARE MAINTAINED.

SOLUTION - DEVELOP PRODUCTION TECHNIQUES FOR LOW OUT-GASSING DEWAR COMPONENTS.

(5077) TITLE - 2 GEN 8-12 MICRON COMMON MODULE F.P. RETROFIT — 745 1150

PROBLEM - IMPROVED THERMAL IMAGING EQUIPMENT OPERATING AT 8-12 MICRONS REQUIRES USE OF A HIGH DENSITY MATRIX ARRAY IN THE ORDER OF 10000 ELEMENTS. THIS EQUIPMENT CANNOT BE MADE WITH PRESENT THERMAL IMAGING OFF-FOCAL-PLANE ARRAY TECHNOLOGY.

SOLUTION - INITIATE A PHASED PROGRAM TO ESTABLISH CONTROLLED MANUFACTURING PROCESSES AND TEST METHODS TO PRODUCE INTEGRATED FOCAL PLAN ARRAY COOLER/DEWAR MODULE S FOR COMMON MODULE RETROFIT PROGRAMS.

(5088) TITLE - TWO DIMENSIONAL STARING ARRAYS — 920

PROBLEM - POOR UNIFORMITY BETWEEN DETECTORS RESULT IN LOSS OF PERFORMANCE OF IR SYSTEMS.

SOLUTION - DEVELOP MANUF. TECHNIQUES TO REDUCE DETECTOR NON-UNIFORMITY.

		FUNDING ($000)				
	PRIOR	83	84	85	86	87
COMPONENT -- ARRAYS (CONTINUED)						
(5151) TITLE - LIQUID PHASE EPITAXIAL HGCDTE		327	3235			
PROBLEM - LOW YIELD ON CURRENT METHOD OF MANUFACTURE OF COMMON MODULE DETECTOR ARRAYS. GROWTH OF HGCDTE CRYSTALS REQUIRES MANUAL LAPPING, POLISHING + THINNING TO ACHIEVE PERFORMANCE SPECIFICATIONS.						
SOLUTION - USE LIQUID PHASE EPITAXIAL GROWTH OF THIN-FILM ON CDTE SUBSTRATE ELIMINATING MANUAL STEPS.						
(5221) TITLE - THERMAL WEAPONS SYSTEM (TWS) ADVANCED FOCAL PLANE. PHASE I					270	
PROBLEM - HIGH DENSITY MATRIX DETECTOR ARRAYS CANNOT BE PRODUCED WITH CURRENT THERMAL IMAGERY ARRAY TECHNOLOGY.						
SOLUTION - ESTABLISH CONTROLLED MANUFACTURING PROCESSES AND TEST METHODS TO PRODUCE INTEGRATED FOCAL PLANE MODULES. ESTABLISH AND VALIDATE PRODUCTION AND TEST METHODS FOR COMPLETED MODULE.						
COMPONENT -- INFRARED/UV						
(5045) TITLE - THERMOELECTRIC COOLER MATERIALS					210	185
PROBLEM - SUPERIOR HIGH PERF. MATERIALS REQUIRED FOR 2 GEN. FLIR TE COOLERS ARE AVAILABLE ONLY IN RESEARCH QUANTITIES + QUALITIES. TRANSITION FROM RESEARCH TO PRODUCTION WILL INTRODUCE VARIOUS DEGRADATION FACTORS.						
SOLUTION - ESTABLISH PRE-PRODUCTION METHODS + TECHNIQUES FOR HIGH QUALITY CONTROL NECESSARY TO MEET 2 GEN. FLIR DEMANDS.						
(5049) TITLE - EBS-CCD ARRAYS (800X800)					1120	
PROBLEM - 800 X 800 ELEMENT CCD ARRAYS ARE CURRENTLY BEING FABRICATED IN THE RESEARCH LAB WITH HIGH COST AND LOW YIELD.						
SOLUTION - DEVELOP MANUFACTURING METHODS TO IDENTIFY AND MAXIMIZE YIELD AND MINIMIZE COST.						
(5059) TITLE - LINEAR RESONANCE COOLERS - PHASE I			500	1000		
PROBLEM - SECOND GENERATION FLIR'S WILL EMPLOY MAGNETIC SUSPENSIONS IN THE CRYOGENIC COOLERS. MAINTAINING CRITICAL SUSPENSION TOLERANCES IN PRODUCTION WILL REQUIRE DEVELOPING EXTENSIVE QUALITY CONTROL PROCEDURES.						
SOLUTION - DEVELOP MANUFACTURING METHODS FOR MAINTAINING CRITICAL TOLERANCES.						
(5180) TITLE - MMT FOR METAL DEWAR AND UNBONDED LEADS		1425	3075			
PROBLEM - THE GOLD WIRE BONDED CONNECTIONS ARE MADE BY HAND WHICH IS A TEDIOUS AND EXPENSIVE PROCESS. THE GLASS STEM IS HAND FASHIONED AND IS PRONE TO DAMAGE.						
SOLUTION - FABRICATING THE STEM WITH THIN METAL WALLS USING PRINTED CIRCUIT FEED THROUGHS WILL REDUCE THE DEFECTS IN PRODUCTION AND DECREASE COST.						

	FUNDING ($000)				
PRIOR	83	84	85	86	87

COMPONENT -- INFRARED/UV (CONTINUED)

(5220) TITLE - THERMAL WEAPONS SYSTEM (TWS) ELECTRONICS, PHASE I — 86: 170

PROBLEM - HIGH DENSITY, HIGH RELIABLITY CIRCUIT CHIPS NEEDED BY THE TWS PROGRAM ARE NOT NOW AVAILABLE.

SOLUTION - ESTABLISH MANUFACTURING TECHNIQUES TO PRODUCE RELIABLE HIGH YIELD, HIGH DENSITY CHIPS OF THE TYPE NEEDED BY THE TWS PROGRAM.

COMPONENT -- LASER

(5066) TITLE - 1 TO 3 MICRON AVALANCHE DETECTORS — 83: 470; 84: 470

PROBLEM - MANUF. COSTS, VOLUME PROD. TECHNIQUES AND RELIABILITY HAVE TO BE ADDRESSED.

SOLUTION - ESTABLISH MANUFACTURING CAPABILITY FOR VOLUME PRODUCTION OF RELIABLE, LOW COST 1-3 MICRON AVALANCE DETECTORS.

CATEGORY

ELECTRON TUBES

COMPONENT -- BEAM

(5019) TITLE - LASER-CUT SUBSTRATES FOR MW TUBES — PRIOR: 432; 83: 408

PROBLEM - PRESENT CFA JAMMER TUBES EMPLOY HIGH COST, PRECISION ANODE CIRCUITS LIMITING UTILIZATION IN OPTIMIZED EW SYSTEMS. HIGH PERFORMANCE AND LOW WEIGHT AT MINIMUM COST IS REQUIRED TO FIELD DESIRED EW SYSTEMS.

SOLUTION - UTILIZE LASER-CUT ANODE CIRCUIT SUBSTRATES TO ACHIEVE DESIRED RF PERFORMANCE AND MINIMIZE PARTS AND OVERALL DEVICE COST. ALSO EMPLOY PHOTOLITHOGRAPHIC TECHNIQUES TO FORM MEANDERLINE CIRCUIT. USE BERYLLIA SUBSTRATE MATERIAL FOR DIELECTRIC SUPPORTS.

COMPONENT -- CATHODE

(5111) TITLE - VAPOR ORGANO METALLIC EPITAXIAL GROWTH PROCESS — 83: 650; 84: 438

PROBLEM - LIQUID EPITAXIAL GROWTH PROCESS REQUIRES- A)LARGE AND COSTLY HIGH TEMP REACTORS, B)LARGE QUANTITIES OF SATURATION MELT MATERIALS, C) COSTLY QUALITY GALLIUM ARSENIDE SUBSTRATES, D)LENGTHY OPERATION PROCESS PER SINGLE GROWTH.

SOLUTION - THE VAPOR-ORGANO-METALLIC PROCESS WILL ENABLE MINIMUM FACILITIZATION REQUIREMENTS, USE OF CONTROLLED GASES REQUIRING NO MELT MATERIALS, POSSIBLE USE OF LESS EXPENSIVE SUBSTRATES, AND MULTIGROWTH PRODUCTION ORIENTED PROCESS.

FUNDING ($000)

	PRIOR	83	84	85	86	87
COMPONENT -- CATHODE (CONTINUED)						
(5218) TITLE - HIGH CURRENT DENSITY CATHODES				475		

PROBLEM - CATHODES OPERATING AT 8A/SQ CM AT 1025 DEG C OPERATING TEMP FOR 2000+ HOURS OF LIFE W/O EMISSION DEGRADATION ARE NOT AVAILABLE. MICROWAVE/MILLIMETER WAVE DEVICES USING STATE-OF-THE-ART CATHODES HAVE SHORT LIVES.

SOLUTION - PROVIDE MANUFACTURING PROCESS FOR HIGH CURRENT DENSITY CATHODES WHICH AT THE REQD 8A/CM DENSITY HAVE OVER TEN TIMES THE LIFE OF PRESENTLY AVAILABLE CATHODES.

COMPONENT -- MISCELLANEOUS

(5102) TITLE - HIGH COERCIVITY,HIGH ENERGY PRODUCT MAGNETS 744

PROBLEM - PRESENT RARE EARTH MAGNETS LIMIT TWT DESIGNS TO AN UPPER FREQ OF 18 GHZ. NEW TUBE DESIGNS FOR THE RANGE ABOVE 18 GHZ INTO THE MM WAVE RANGE REQUIRE NEW HIGHER COERCIVITY, HIGHER ENERGY PRODUCT MAGNETS NOT COMMERCIALLY AVAILABLE IN THE USA.

SOLUTION - DEVELOP USA MANUFACTURING CAPABILITY FOR SAMARIUM-TWO COBALT METAL SUBSTITUENTS TO ENHANCE THE COERCIVITY AND ENERGY PRODUCT

CATEGORY
FREQUENCY CONTROL

COMPONENT -- OSCILLATORS

(5262) TITLE - VIBRATION IMMUNE LOW PHASE NOISE OSCILLATOR 300 460

PROBLEM - TO STOP PHASE NOISE 2 MATCHED RESONATORS AND AN ACCELEROMETER MUST BE FABRICATED. ALIGNMENT OF THE RESONATOR PAIR + ALIGNMENT OF THE ACCELEROMETER TO THEM ARE DIFFICULT. TOLERANCES OF ONE ARC MINUTE MUST BE HELD ON A HIGH THRUPUT BASIS.

SOLUTION - STARTING WITH RESONATORS OF LOWEST VIBRATION SENSITIVITY AVAILABLE, THE MODULE WILL BE ASSEMBLED ON A PRECISION FIXTURE WHICH ALLOWS SIX DEGREES OF FREEDOM.

CATEGORY
GENERAL

	FUNDING ($000)				
	PRIOR	83	84	85	86	87
COMPONENT -- COMPONENTS						
(5107) TITLE - MILLIMETER WAVE POWER SOURCE COMBINER		205	974			
PROBLEM - DIODE PARAMETERS VARY GREATLY FROM UNIT TO UNIT. PACKAGING METHODS ARE UNSATISFACTORY FOR COMBINER CIRCUITS. TUNING COMBINER ELEMENTS AND ADJUSTING ASSOCIATED MODULATING CIRCUITS TAKES WEEKS OF EFFORT TO OBTAIN REQUIRED PERFORMANCE LEVELS.						
SOLUTION - OPTIMIZE FABRICATION PROCESS AND ESTABLISH TECHNIQUES OF DIODE AND PACKAGE PRODUCTION RESULTING IN HIGH YIELDS OF REPRODUCIBLE COMBINER USABLE DEVICES. OPTIMIZE COMBINER CIRCUITS AND MODULATORS FOR HIGH PERFORMANCE AND UNCOMPLICATED TUNINGS.						
(5108) TITLE - LOW COST PRECISION MICROWAVE PHASE SHIFTER					375	
PROBLEM - MODERN LOW SIDE LOBE PHASED ARRAY ANTENNAS REQUIRE PRECISION PHASE SHIFTERS. PRESENTLY PRECISION PHASE SHIFTERS ARE TOO EXPENSIVE BECAUSE OF THE LARGE AMOUNT OF LABOR REQUIRED TO ACHIEVE THE DESIRED PERFORMANCE.						
SOLUTION - SOLUTION IS TO REDUCE PHASE SHIFTER AND ITS DRIVER CIRCUITRY COST THROUGH AUTOMATION OF ASSEMBLY TECHNIQUES, ACTIVE MICROWAVE PHASE TRIMMING AND TESTING OF THE PHASE SHIFTER.						

CATEGORY
GUIDANCE SYSTEM

COMPONENT -- SEEKERS						
(5264) TITLE - PLANAR MONOLITHIC GAAS MIXERS 35, 60, 94 GHZ					600	740
PROBLEM - COSTS ARE HIGH DUE TO POOR MANUFACTURING YIELD.						
SOLUTION - ESTABLISH AUTOMATIC PROCESSING AND CONTROL TO ASSURE HIGHER YIELD AND LOWER COSTS.						
(5267) TITLE - MONOLITHIC INP VCO						740
PROBLEM - UNIFORMITY AND REPRODUCIBILITY OF INP EPITAXIAL MATERIAL RESULTS IN LOW YIELD.						
SOLUTION - AUTOMATE MATERIALS PROCESSING AND CONTROL SYSTEMS.						

CATEGORY
INTEGRATED ELECTRONICS

		FUNDING ($000)				
	PRIOR	83	84	85	86	87
COMPONENT -- CIRCUITRY						
(5001) TITLE - SOLID STATE SCAN CONVERTER COPLANAR MICROELECTRONICS					710	
PROBLEM - HIGH PERFORMANCE FLIR WITH REMOTE TV COMPATIBLE DISPLAYS REQUIRE SOLID STATE SCAN CONVERTERS FOR SIGNAL PROCESSING. CURRENT PRINTED CIRCUIT BOARD TECHNOLOGY PREVENTS IMPLEMENTATION OF THESE ELECTRONICS INTO HIGH DENSITY PACKAGES.						
SOLUTION - UTILIZE A 3 DIMENSIONAL MICROELECTRONIC INTERCONNECTION TECHNOLOGY AIMED AT HIGH PRODUCTION VOLUME WHERE LOW UNIT COST, HIGH DEVICE DENSITY, GOOD POWER DISSIPATION, HIGH LOGIC SPEED AND LOW EMI SUSCEPTIBILITY ARE DRIVING REQUIREMENTS.						
(5137) TITLE - FABRICATION TECHNIQUES FOR HIGH SPEED VHSIC					635	
PROBLEM - R AND D DESIGNS OF VHSIC MODULES ARE ENCOUNTERING YIELD PROBLEMS AFTER TRANSFER TO PRODUCTION LINES. HIGH DENSITY OF CIRCUITS IS NOT COMPATIBLE WITH EXISTING IN-PROCESS SCREENING AND PROCESS CONTROL METHODS.						
SOLUTION - VHSIC CHIP WILL BE SUBJECTED TO DESIGN ITERATIONS AND PROCESS CHANGES TO MAKE CIRCUITS PRODUCIBLE AND IMPROVE YIELDS. HIGH SPEED TEST METHODS WILL BE DEVELOPED TO REDUCE COST OF PRODUCTION SCREENING.						
(5168) TITLE - AUTOMATIC RETICLE INSPECTION SYSTEM, PHASE I		600	575	700		
PROBLEM - THERE IS NO WAY TO CHECK TAPE-GENERATED RETICLE PATTERNS AGAINST THE COMPUTER-GENERATED MASTER TAPE. VISUAL INSPECTION OF RETICLES FOR PINHOLES OR DUST PARTICLES IS VERY DIFFICULT.						
SOLUTION - USE PATTERN RECOGNITION EQUIPMENT TO COMPARE THE RETICLE PATTERN WITH THE ORIGINAL COMPUTER OUTPUT. MAKE A RECORD OF DEFECTS THAT WILL PERMIT REPAIR OF THE RETICLE.						
(5234) TITLE - MMT FOR MILLIMETER-WAVE THREE TERMINAL DEVICES				1500	600	300
PROBLEM - OSCILLATORS, AMPLIFIERS, SWITCHES, MIXERS AND PHASE SHIFTERS USED AT 60 AND 94 GIGAHERTZ ARE NOW BUILT IN SMALL QUANTITIES USING LAB METHODS. COMPONENT SELECTION, MATCHING, ASSEMBLY + TEST MUST BE REPLACED BY INTEGRATED CIRCUIT MANUFACTURING METHODS.						
SOLUTION - USE AUTOMATED VAPOR PHASE EPITAXY AND ION IMPLANTATION ON LARGE AREA WAFERS, ELECTRON BEAM LITHOGRAPHY FOR SUB-MICON GATE DEFINITION, MULTILAYER METALLIZATION FOR INTERCONNECTION, ION BEAM ETCHING OF RECESSED GATES, PASSIVATION, + AUTOMATED TEST.						
(5259) TITLE - MICRON IC FABRICATION INSPECTION TECHNIQUES					90	370
PROBLEM - INTEGRATED CIRCUITS WITH MICRON FEATURE SIZE CAN BE FABRICATED BUT ONLY AT UNACCEPTABLY LOW YIELD. THIS IS MOSTLY DUE TO A LACK OF EFFECTIVE INSPECTION TOOLS FOR X-RAY MASKS OR E-BEAM DIRECT WRITE PATTERNS.						
SOLUTION - ADAPT AUTOMATED SCANNING ELECTRON METHODS TO THE RAPID IDENTIFICATION OF MASK OR METALLIZATION ERRORS AND APPLY METHODS FOR INSTANT REPAIR OF MINOR DEFECTS.						

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- CIRCUITRY (CONTINUED)							
(5266)	TITLE - MONOLITHIC BROADBAND BALANCED MIXER					225	370
	PROBLEM - PRECISE REPEATABILITY OF ASSEMBLY (BAND LENGTHS, DIE PLACEMENT) IS REQUIRED TO ACHIEVE REQUIRED BROADBAND PERFORMANCE. ASSEMBLY AND TESTING TIMES ARE LONG, LEADING TO HIGH COST.						
	SOLUTION - DEVELOP MFG PROCESS TO MONOLITHICALLY FABRICATE, ON GAAS SUBSTRATES, COMPLETE MIXER INCLUDING ACTIVE DEVICES, MATCHING CIRCUITS AND BALUNS. AUTO CONTROL OVER PROCESS PARAMETERS IS NECESSARY TO MAINTAIN ELECTRICAL PERFORMANCE.						
COMPONENT -- GUIDANCE SYSTEMS							
(5212)	TITLE - MICROELECTRONIC PACKAGES FOR VHSIC				600		
	PROBLEM - THE PRODUCIBILITY OF CERAMIC PACKAGES WITH HIGH TERMINAL COUNTS LEADING TO POOR YIELDS AND HIGH PACKAGE COST						
	SOLUTION - UNDER FY80 R+D, AN ATTEMPT TO ADVANCE CERAMIC PROCESSING TECHNIQUES AND RELATED MFG CONTROLS IS BEING MADE TO IMPROVE POOR MULTILAYER FINE PITCH PACKAGE YIELDS. THIS MMT EFFORT WILL TRANSLATE THOSE TECHNIQUES TO THE MANUFACTURING MODE.						
(5213)	TITLE - PRECISION HIGH-QUALITY VHSIC X-RAY MASKS				388		
	PROBLEM - MASK MEMBRANES FOR X-RAY LITHOGRAPHY OF VHSIC CHIPS ARE HIGH IN COST AND LACK GOOD, QUICK RESPONSE AND STABILITY.						
	SOLUTION - DEVELOP PROCEDURES, METHODS AND FABRICATION STEPS TO PRODUCE LOW-COST, STABLE AND DURABLE X-RAY MASKS AND MASK MEMBRANES.						
(5214)	TITLE - HIGH SPEED D/A CONVERTER FOR VHSIC E-BEAM SYSTEM				450		
	PROBLEM - D/A CONVERTERS NEEDED FOR HIGH-SPEED VHSIC E-BEAM MACHINES ARE EXTREMELY HIGH IN COST AND HAVE VERY LIMITED AVAILABILITY.						
	SOLUTION - ESTABLISH A SOURCE FOR PRODUCING HIGH-SPEED D/A CONVERTERS AND DEVELOP QA PROVISIONS TO MEET MIL-STD ENVIRONMENTAL TESTS.						
(5215)	TITLE - HIGH-SPEED DIGITAL VHSIC MICROCIRCUITS					745	
	PROBLEM - THE PROBLEM OF INSERTION OF VHSIC TECHNOLOGY INTO PLRS WILL BE ADDRESSED TO REDUCE BOTH COST AND SIZE OF THE EQUIPMENT.						
	SOLUTION - MULTILAYER PACKAGES ARE BEING DEVELOPED TO MAXIMIZE CIRCUIT PACKING AND INTERCONNECTION EFFICIENCY. SOURCES FOR PACKAGES TO HOUSE VHSIC CHIPS AND INTERCONNECTION BOARDS WILL BE ESTABLISHED TO REDUCE SIZE AND COST OF PLRS MODULES.						

CATEGORY	PRIOR	FUNDING ($000) 83	84	85	86	87
IPIP						
COMPONENT -- MISCELLANEOUS						
(5196) TITLE - INDUSTRIAL PRODUCTIVITY IMPROVEMENT (ELECTRONICS)		893	1500			
PROBLEM - MANY ELECTRONICS ITEMS PRODUCED FOR ARMY ARE BUILT IN FACTORIES NOT USING MODERN METHODS AND EQUIPMENT, AUTOMATIC MATERIALS HANDLING SYSTEMS, OR COMPUTERIZED MANAGEMENT INFORMATION SYSTEMS. THESE PLANTS MUST BE UPDATED TO IMPROVE PRODUCTIVITY.						
SOLUTION - ANALYZE A CONTRACTORS FACILITY, EVALUATING BOTH MANUFACTURING TECHNIQUES AND MANAGEMENT SYSTEMS. INCLUDE MATERIALS HANDLING, LAYOUT, INVENTORY CONTROL, CAM, PRODUCTION EQUIPMENT, AND MIS. IDENTIFY NEW METHODS ' EQUIPMENT. DEVELOP A CAPITAL ACQ. PROG.						
CATEGORY						
LASER						
COMPONENT -- GENERAL						
(5113) TITLE - 10-MICRON PULSED WAVEGUIDE LASER				690		
PROBLEM - PRESENTLY PULSED WAVEGUIDE CARBON DIOXIDE LASERS FOR USE AS SOURCES FOR MISSILE BEAMRIDERS AND BEACONS ARE FABRICATED IN SMALL QUANTITIES BY HIGHLY SKILLED PERSONS. ELECTRODES, MIRRORS, AND CERAMIC CAVITY HOUSING REQ. PRECISE FABRICATION AND ASSY.						
SOLUTION - ESTABLISH LARGE SCALE PRODUCTION OF LASER COMPONENTS INCLUDING MIRRORS, ELECTRODES, AND LASER ENVELOPES TO REDUCE COSTS. DEVELOP UNITS THAT ARE RESISTANT TO THE SHOCK AND VIBRATION OF A TANK ENVIRONMENT.						
(5222) TITLE - LONG LENGTH ND/YAG BOULES					360	
PROBLEM - HIGH QUALITY ND/YAG BOULES ARE EXTREMELY DIFFICULT TO GROW EVEN AFTER TWO PREVIOUS MMT EFFORTS ATTEMPTED TO INCREASE YIELD, ROD SIZE AND ROD EXTRACTION.						
SOLUTION - A NEW CRYSTAL GROWTH METHOD, VERTICAL SOLIDIFICATION OF MELT (VSOM), PROMISES AN EFFICIENT, LOW COST SOLUTION TO THE SHORTAGE OF ROD MATERIAL. THIS PROCESS, DEMONSTRATED IN THE LAB, NEEDS TO BE TRANSITIONED TO FULL PRODUCTION.						
CATEGORY						
OPTICS						

	FUNDING ($000)				
PRIOR	83	84	85	86	87

COMPONENT -- LENSES

(5192) TITLE - THERMAL WEAPONS SYSTEM (TWS) IR OPTICS - PHASE I — 84: 165

PROBLEM - IR OPTICS FOR TWS WILL CONTAIN SEVERAL ELEMENTS WITH ASPHERIC SURFACES WHICH WILL PROBABLY BE MICROMACHINED BY NC DIAMOND CUTTING TOOLS. PRESENT METHOD TURNS ONE SURFACE ON ONE ELEMENT AT A TIME. THIS IS EXPENSIVE.

SOLUTION - DETERMINE MINIMUM TOLERANCES REQUIRED AND DEVELOP EQUIPMENT AND PROCESSES TO FABRICATE A PLURALITY OF LENS SURFACES SIMULTANEOUSLY. ALSO DEVELOP PRODUCTION QUANTITY TEST AND ACCEPTANCE TECHNOLOGY.

CATEGORY
PASSIVE COMPONENTS

COMPONENT -- MISCELLANEOUS

(5109) TITLE - ULTRAWIDE BANDWIDTH SAW DELAY LINES — PRIOR: 526; 83: 408

PROBLEM - BROADBAND SAW DELAY LINES ARE REQUIRED FOR SIGNAL STORAGE DEVICE BANDWIDTH IS FIXED BY NEED TO STORE SIGNALS FOR A TEN MICROSECOND DURATION FOR SIGNALS RANGING OVER 500 MHZ BAND. DEVICE INSERTION LOSS AND MULTIPLE TRANSMIT REFLECTIONS MUST BE MINIMAL

SOLUTION - ESTABLISH PRODUCTION CAPABILITY FOR SAW DELAY LINES OPERATING AT 1GHZ USING IDENTICAL BROADBAND,NON-PERIODIC INTERDIGITAL TRANSDUCERS ON LITHIUM NIOBATE SUBTRATES. HIGH RESOLUTION PHOTOLITHOGRAPHIC FABRICATION WILL USE DIRECT PROJECTION PRINTING.

(5232) TITLE - LOW COST MILLIMETER WAVE FERRITE CIRCULATORS — 85: 700; 86: 600; 87: 200

PROBLEM - CIRCULATORS CONSIST OF SEVERAL PARTS CEMENTED INTO A METAL HOUSING. THERE IS A LOT OF HAND ASSEMBLY AND TUNING LABOR.

SOLUTION - USE CENTERLESS GRINDING OF FERRITE RODS AND GANG SAWING INTO SMALL PUCKS. USE NC MACHINING OR PRECISION CASTING OF SMALL HOUSINGS. BY MACHINE, ASSEMBLE AND CEMENT PARTS INTO CAVITIES IN THE HOUSING. USE MACHINE TUNING AND TESTING.

CATEGORY
POWER SOURCES

		FUNDING ($000)				
	PRIOR	83	84	85	86	87
COMPONENT -- BATTERIES						
(5162) TITLE - EXJAM BATTERY MANUFACTURING TECHNOLOGY, PHASE I		45	803			
PROBLEM - PRESENT R AND D MODELS OF UNATTENDED EXPENDABLE JAMMER RESERVE POWER SUPPLY (UEJPS) ARE HAND MADE 1 OR 2 AT A TIME. UNLESS FABRICATION/ASSEMBLY ARE PRODUCTION ENGINEERED, LABOR COSTS WILL MAKE THE BATTERY PROHIBITIVELY EXPENSIVE.						
SOLUTION - EVALUATE THE VARIOUS STEPS IN FABRICATION/ASSEMBLY FOR UEJPS HOW BEST TO MAKE IN HIGH VOLUME. DESIGN, BUILD AND VALIDATE PROTOTYPE TOOLING AND MACHINERY FOR CONVERTING TO HIGH VOLUME PRODUCTION.						
COMPONENT -- MISCELLANEOUS						
(5037) TITLE - TWO MEGAWATT HIGH ENERGY LASER SWITCH					1120	
PROBLEM - PROPOSED MILITARY DIRECTED BEAM WEAPONS WILL REQUIRE MULTIMEGAWATT AVERAGE PULSED POWER TO OPERATE DELIVERY SYSTEM.						
SOLUTION - PRODUCE TWO MEGAWATT PULSE MODULES WHICH WILL CONVERT THE INCOMING MEGAWATTS OF DC POWER INTO HIGH ENERGY PULSES. MODULES COULD BE STACKED TO MEET THE PARTICULAR SYSTEM NEEDS.						

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CATEGORY

SOLID STATE

COMPONENT -- DELAY LINES						
(5174) TITLE - AUTOMATIC SPUTTERING PROCESS CONTROL F/PRODUCING ZNO PHASE I		150	422			
PROBLEM - GAS MIXTURE, ZNO PURITY + SPUTTERING PARAMETERS ARE MANUALLY MONITORED USING A MASS ANALYZER. CORRECTIONS IN FLOW + DEPOSITION PROCESSES ARE SLOW AND PERFORMED AFTER OCCURRENCE.						
SOLUTION - LATEST STATE-OF-THE-ART MASS ANALYSIS EQUIPMENT WILL BE COMPUTER/ MICROPROCESSOR COUPLED TO THE PROCESSING EQUIPMENT USED FOR FABRICATING ZNO DELAY LINES. VACUUM DEPOSITION AND GAS FLOW RATES WLL BE OPTIMIZED.						
(5263) TITLE - SAW DEVICES WITH SUB-MICRON ELECTRODES					75	320
PROBLEM - MASS PRODUCTION CAPABILITY FOR SURFACE ACOUSTIC WAVE (SAW) DEVICES, WHICH USE TRANSDUCER GEOMETRIES WITH SUB-MICRON ELECTRODE DIMENSION, DOES NOT EXIST.						
SOLUTION - MODIFY, DEVELOP AND OPTIMIZE THE NECESSARY E-BEAM PHOTOLITHOGRAPHIC PROCEDURES SUFFICIENTLY TO MAKE THEM AVAILABLE AS A PRODUCTION TOOL FOR THE QUANTITY FABRICATION OF SAW DEVICES.						

		FUNDING ($000)				
	PRIOR	83	84	85	86	87
COMPONENT -- DIODES/RECTIFIERS						
(3010) TITLE - MILLIMETER-WAVE SOURCES FOR 60 AND 94 GHZ		363		650		
PROBLEM - TO ESTABLISH A MANUFACTURING CAPABILITY FOR PRODUCTION OF IMPATT DIODES WHICH ARE UNIFORM ENOUGH TO BE FIELD REPLACEABLE IN ARMY SYSTEMS.						
SOLUTION - ESTABLISH TECHNIQUES AND PROCESSES CAPABLE OF PRODUCING SILICON DOUBLE DRIFF IMPATT SOURCES. PRECISE AND RIGOROUS COMPUTER CONTROL OF ALL MATERIAL IS REQUIRED.						
(5187) TITLE - TUNABLE MILLIMETER WAVE INP GUNN SOURCES				1150	575	300
PROBLEM - TUNABLE MILLIMETER WAVE INP GUNN SOURCES ARE CURRENTLY HAND MADE IN THE LABORATORY BECAUSE THERE ARE NO PROCESSES FOR FABRICATION AND TESTING IN VOLUME.						
SOLUTION - ESTABLISH AUTOMATED PROCESSING AND TESTING ADDRESSING VARACTOR OPTIMIZATION, ECONOMIC DIODE PACKAGING, TUNING-COUPLING-BIAS NETWORK FABRICATION. SOURCE FABRICATION AND COMPUTER AIDED TESTING.						
COMPONENT -- TRANSISTORS						
(5054) TITLE - MONOLITHICALLY MATCHED POWER GA-AS FETS					600	
PROBLEM - GAAS MICROWAVE POWER FETS REQUIRE LARGE GATE WIDTHS TO ACHIEVE HIGH OUTPUT POWER LEVELS LOW TERMINAL IMPEDANCES ACCOMPANY THE LARGE GATE WIDTHS AND ADVERSELY EFFECT A DEVICES BANDWIDTH CAPABILITY AND OVERALL RF PERFORMANCE.						
SOLUTION - ESTABLISH PRODUCTION TECHNIQUES TO FABRICATE MONOLITHIC MATCHING CIRCUITS FOR POWER COMBINING A NUMBER OF SMALLER GATE WIDTH CELLS RESULTING DEVICES WILL HAVE HIGH USABLE TERMINAL IMPEDANCES AND INTRINSIC DEVICE RF PERFORMANCE WILL BE PRESERVED.						
(5075) TITLE - MICROWAVE SILICON FETS					600	
PROBLEM - HIGH PERFORMANCE MICROWAVE SILICON FETS REQUIRE GRADED EPITAXIAL DOPING PROFILES. HIGH YIELD DEMANDS GREATER PROCESS CONTROL.						
SOLUTION - PROCESSES FOR ACCURATELY CONTROLLING THE GROWTH OF GRADED EPITAXIAL SILICON MATERIAL WILL BE ESTABLISHED.						
(5265) TITLE - INTERNALLY MATCHED POWER FET					300	500
PROBLEM - POWER DEVICES ARE CURRENTLY HAND ASSEMBLED, WITH MANY WIRE BANDS. THIS LEADS TO HIGH COST AND VARIABILITY OF RF PERFORMANCE.						
SOLUTION - AUTOMATE MANUFACTURE OF POWER DEVICES, TO INCLUDE (1) PROCESSING ADAPTED FROM EARLIER MMT PROJECTS (2) AUTO HANDLING AND PACKAGING OF FET DIE (3) AUTO TESTING AND (4) PRINTED MATCHING CIRCUITRY ON GAAS.						

	FUNDING ($000)					
	PRIOR	83	84	85	86	87
COMPONENT -- TRANSISTORS (CONTINUED)						
(5268) TITLE - MEDIUM POWER SOLID STATE TRANSMIT MODULE						370

PROBLEM - A NUMBER OF R+D PROCESSES DEVELOPED FOR SOLID STATE POWER AMPS HAVE NOT BEEN ADAPTED TO A MFG ENVIRONMENT. THEY INCLUDE THERMAL GROUNDING, IMPEDANCE MATCHING TO LARGE DEVICES AND PHASE AND GAIN CONTRUL.

SOLUTION - APPLY COMPUTER CONTROL AND AUTO HANDLING TECHNIQUES TO THE OVERALL ASSEMBLY, PACKAGING AND TESTING OF THE AMPLIFIERS. ITERATIVE PHASE AND GAIN TRIM USING TEST MEASURING CONTROLLED LASER WILL BE INCLUDED.

ARMY MATERIALS AND MECHANICS RESEARCH CENTER (AMMRC)

US ARMY MATERIALS AND MECHANICS RESEARCH CENTER

(AMMRC)

The Army Materials and Mechanics Research Center (AMMRC) is designated the DARCOM Lead Laboratory for Materials Testing Technology. In this role, AMMRC is responsible for management and direction of the DARCOM materials testing technology activities and formulation of the Materials Testing Technology (MTT) Program. This program formulation is accomplished by identifying and defining materials testing problem areas in response to system requirements of the DARCOM R&D and Readiness Commands and Project Managers utilizing materials testing technology. The Lead Laboratory mission also encompasses the advising and assisting of the major subordinate commands and Project Managers in the utilization of Materials Testing Technology in order to assure a smooth transition from the developmental to the production phases of the life cycle. Concurrent with the above responsibilities is the furnishing of technical assistance in the application of methods and techniques in solving material problems in connection with procured items. Specific areas of effort are as follows:

a. Automated Testing

One of the primary needs in NDT and in inspection in general is to remove the decision-making from the inspector where possible. Efforts will be intensively directed toward providing engineering prototype systems utilizing automated decision-making. These include automated radiographic and ultrasonic techniques, optical/laser techniques, and computerized chemical analysis. The ultimate goal in all automated testing systems is the essential feedback to the total system for automated process control.

b. Predictive Failure

The need for diagnostic measurement techniques for anticipation of catastrophic failure and for the measurement of remaining life, both in operating equipment and in units being overhauled and rebuilt, presents a tremendous opportunity for cost savings and reliability improvement. A principal thrust has come from the loss of diagnostics and in-situ measurements adjunct to non-destructive testing represents the real time use of NDT techniques with analysis and decision elements built in.

c. Materials

As the newer materials are utilized in major weapon systems, it is imperative that new and/or improved inspection techniques be available to measure characteristics or parameters to assure adequate and reliable performance. Of particular interest in the next five years are composites, elastomers, plastics, and ceramics, with continuing interest in metals and energetics (explosives, pyrotechnics, and propellants).

d. Techniques

Specifically covered in the objectives of the MTT Program is the investigation of specific physical principles which can potentially offer significant improvement in sensitivity, cost, portability, or speed, and combination of these. The development and application of techniques, such as ultrasonics, infrared, holography, spectroscopy, chromatography, etc, can significantly improve DARCOM materiel and offer substantial improvement in process control.

The MTT Program effected a test method categories classification change in FY 1980 to more accurately reflect certain current technology interests. Historically, the Program has always included the testing of electronic materials and materiel under one of three broad test method categories: nondestructive, chemical, or mechanical testing. However, electronic materials and materiel are often used in highly mission-critical applications and they usually employ and reflect advanced and sophisticated technologies, not only in their production but in their quality assurance inspection procedures. It was therefore determined that it would be in the best interest of the overall MTT Program to provide enhanced visibility to this highly relevant subject. Accordingly (starting in FY 1983), a fourth MTT test method category was established; namely, "Electronics".

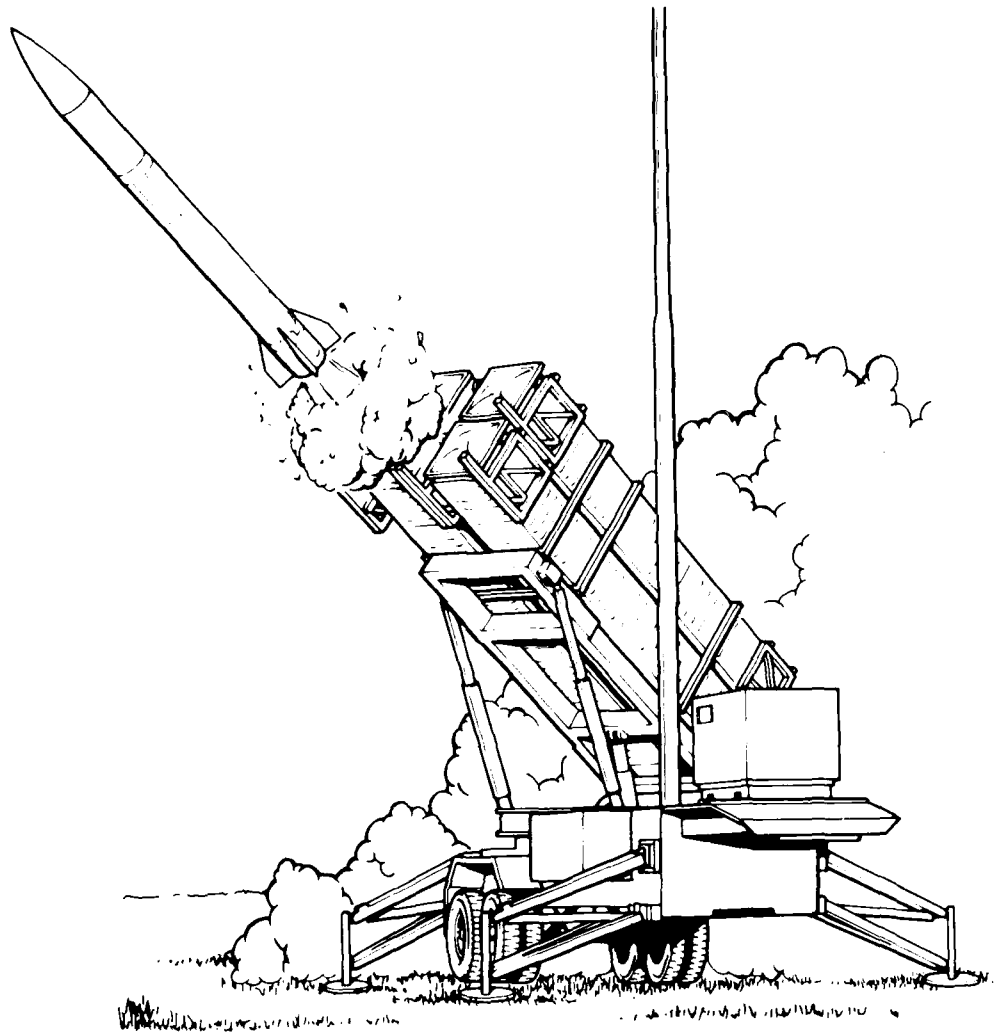
AMMRC/DARCOM

COMMAND FUNDING SUMMARY
(THOUSANDS)

CATEGORY	FY83	FY84	FY85	FY86	FY87
GENERAL	370	970	1000	850	250
TESTING	1900	5000	5500	6000	6500
TOTAL	2270	5970	6500	6850	6750

CATEGORY			FUNDING ($000)					
			PRIOR	83	84	85	86	87
GENERAL								
COMPONENT -- MISCELLANEOUS								
	(5052)	TITLE - ARMY ENGINEERING DESIGN HANDBOOK FOR PRODUCTION SUPPORT	4641	120	720	750	600	
		PROBLEM - TECHNICAL SCIENTIFIC AND ENGINEERING DATA IS CONTINALLY BEING GENERATED WITHIN THE ARMY AND NEEDS TO BE COLLECTED IN APPROPRIATE DOCMENTS.						
		SOLUTION - INITIATE REVISE AND UPDATE DATA USED IN PRODUCTION OF MILITARY HARDWARE AND EQUIPMENT.						
	(6390)	TITLE - PROGRAM IMPLEMENTATION AND INFORMATION TRANSFER	893	250	250	250	250	250
		PROBLEM - THE SUCCESS OF THE MMT PROGRAM IS VERY DEPENDENT ON WHETHER THE RESULTS OF MMT WORK GET IMPLEMENTED. THIS IN TURN IS DEPENDENT ON WHETHER INFORMATION CONCERNING THE MMT TECHNOLOGY IS MADE AVAILABLE AND USED BY CONCERNED PARTIES.						
		SOLUTION - INSURE THAT THE MMT RESULTS ARE DOCUMENTED AND GIVEN WIDE DISTRIBUTION SO AS TO ENCOURAGE IMPLEMENTATION.						
CATEGORY								
TESTING								
COMPONENT -- CHEMICAL								
	(6350)	TITLE - MATERIALS TESTING TECHNOLOGY (MTT)	3628	275	650	700	700	780
		PROBLEM - CURRENT LABORATORY METHODS FOR CHEMICAL TESTING ARE SPECIALIZED AND EXPENSIVE. REAL TIME TESTING TECHNIQUES ARE NEEDED TO CONTROL CHEMICAL PROCESSING.						
		SOLUTION - ADAPT QUICK RESPONSE CHEMICAL TESTING EQUIPMENT TO AUTOMATE THE CONTROL OF CHEMICAL PROCESSES.						
COMPONENT -- ELECTRONICS								
	(6350)	TITLE - MATERIALS TESTING TECHNOLOGY (MMT)	4838	769	1100	1500	1700	1920
		PROBLEM - ELECTRONIC ITEMS AND ANCILLARY DEVICES ARE AMONG THE MOST TECHNICALLY SOPHISTICATED AND MISSION-CRITICAL OF THE ARMY INVENTORY. CURRENT TESTING OF THESE ITEMS IS EQUALLY SOPHISTICATED, TIME-CONSUMING, AND DIFFICULT TO ADAPT TO PRODUCTION ENVIRONMENT.						
		SOLUTION - ADAPT CURRENT AND DEVELOPING STATE-OF-THE-ART TESTING TECHNIQUES TO SIMPLIFIED, RAPID INSPECTION SYSTEMS FOR ON-LINE REAL-TIME, PRODUCTION QUALITY ASSURANCE.						

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT	-- MECHANICAL						
(6350)	TITLE - MATERIALS TESTING TECHNOLOGY (MTT)	6047	180	750	750	800	800
	PROBLEM - METHODS OF MECHANICAL TESTING ARE BASICALLY TIME CONSUMING, LABORATORY TYPE OPERATIONS. THE TESTING IS OFTEN ULTIMATE AND THEREFORE DISTRUCTIVE OR IT TENDS TO INTRODUCE RESIDUAL STRESS/STRAIN IN THE TESTED ITEMS.						
	SOLUTION - ESTABLISH IMPROVED REAL-TIME INSPECTION TECHNIQUES TO REDUCE PRODUCTION BOTTLENECKS ASSOCIATED WITH MECHANICAL TESTING. ALSO, THE OPTIMUM TESTING CRITERIA WILL BE ESTABLISHED WHEN NECESSARY.						
COMPONENT	-- NON-DESTRUCTIVE TESTING						
(6350)	TITLE - MATERIAL TESTING TECHNOLOGY	15722	676	2500	2550	2800	3000
	PROBLEM - DESTRUCTIVE AND CERTAIN CONVENTIONAL NON-DESTRUCTIVE TESTING TECHNIQUES ARE RESPECTIVELY UNSUITED AND INADEQUATE OR HARD TO BE ADAPTED TO ON-LINE PRODUCTION TESTING USAGE.						
	SOLUTION - DETERMINE FEASIBILITY OF ADAPTING LAB-PROVEN NDT METHODS OR MODIFYING THE EXISTING TEST PROCEDURES FOR ON-LINE PRODUCTION QUALITY ASSURANCE TESTING.						



MISSILE COMMAND
(MICOM)

US ARMY MISSILE COMMAND

(MICOM)

The US Army Missile Command is located at Redstone Arsenal, AL, and is responsible for research, development, and acquisition of missile systems for the Army. Facilities include flight test ranges, laboratories, and a simulation center.

Major systems managed by special project offices include STINGER (Shoulder-Fired Air Defense Guided Missile), MLRS (Multiple Launched Rocket System), Viper (Short-Range Anti-Tank Weapon), HELLFIRE (Helicopter-Carried Air-To-Ground Missile), PERSHING (Extended Range Ground-To-Ground Missile) and the 2.75 Inch Air-To-Ground Rocket. MICOM is also the Army's center for laser research and manages efforts to apply lasers in missile guidance and as weapons.

MICOM supports technological thrusts in the following electronics areas: (1) Manufacturing techniques for multiple chips employing multiple technologies that are projected to be in the mainstream of the semiconductor marketplace for many years to come. (2) Electronic computer-aided manufacturing and hybrid computer-aided design and manufacturing in order to automate microelectronic production lines and therefore improve productivity, increase fabrication speed and decrease unit cost. (3) Elimination of precious metals from military hybrid micro-circuits and their replacement with materials which are universally available and economically attractive.

A major thrust in MICOM's MMT Program is guidance systems. A large amount of this effort is planned for work on printed circuits and seekers. Efforts in the electronics area include projects on semi-additive printed wiring board manufacturing, modularizing millimeter wave transponders, and volume methods for electronic homing subsystems. The seeker area includes work on infrared optics, radio frequency, and laser optics. Other work planned on guidance systems include projects for windows and radomes, optics, and hybrid circuits.

Another thrust area is missile structures, which includes projects for airframes using metal, plastic, or composites. Efforts for composite airframes will address drawing of fuzed silica fibers, weaving 3D carbon/carbon nosetips, and wrapping techniques for high angle heatshields.

Propulsion system components such as motor cases, nozzles, and propellants are the subjects of several manufacturing technologies efforts. Work will address production processes for fabricating composite motor cases with integral pole pieces and attachments, motor case insulators wound from rubber strips, and continuous propellant mixing and loading.

Proposals in the area of test equipment include work on electrical components where efforts cover screening of chips, ultra-high resolution inspection for large scale integrated circuits and validation for semiconductor devices.

MICOM

COMMAND FUNDING SUMMARY
(THOUSANDS)

CATEGORY	FY83	FY84	FY85	FY86	FY87
CONTAINERS/LAUNCHERS	0	0	0	0	688
CONTROL SYSTEM	0	0	2000	2000	300
GENERAL	0	2400	6200	3950	9491
GROUND SUPPORT EQUIPMENT	0	0	2041	1487	280
GUIDANCE SYSTEM	0	0	6075	12514	17474
INTEGRATED ELECTRONICS	1000	1200	750	1300	5380
IPIP	0	0	5000	2000	0
MISSILE STRUCTURE	0	0	0	550	2000
PROPULSION SYSTEM	1580	1225	1330	900	5252
TEST EQUIPMENT	710	1925	900	1000	500
TOTAL	3290	6750	24296	25701	41365

CATEGORY		FUNDING ($000)				
	PRIOR	83	84	85	86	87
CONTAINERS/LAUNCHERS						
COMPONENT -- LAUNCHERS						
(1027) TITLE - LOW COST SMALL ROCKET CONTAINER/LAUNCHER PODS						338
PROBLEM - HEAVY, EXPENSIVE METAL CONSTRUCTION, REQUIRED REUSE + REPAIR/REPLACE (AFTER 8 FIRINGS) AND A REQUIRED STRENGTH TO SURVIVE A 3 FT DROP ARE AMONG THE PROBLEMS ENCOUNTERED.						
SOLUTION - ESTABLISH CAPABILITY FOR LOW COST EXPENDABLE CONTAINER/LAUNCHER USING HIGH RATE PROCESSING AND LOW COST PLASTICS. ACHIEVE AND MAINTAIN DIMENSIONAL STABILITY OF LOADED PAD.						
COMPONENT -- SHIPPING CONTAINERS						
(3108) TITLE - MISSILE/ROCKET DISPENSING SYSTEM						350
PROBLEM - DISPENSING UNITS ARE FABRICATED, ASSEMBLED, AND TESTED BY HAND.						
SOLUTION - ESTABLISH AUTOMATED AND SEMI-AUTOMATED SYSTEM FOR PRODUCING THE DISPENSING DEVICE						
CONTROL SYSTEM						
COMPONENT -- CIRCUITRY						
(1115) TITLE - IMP MFG PROC/10 MICROMETER DIODES/OPTICAL BEAMRIDER APPL						300
PROBLEM - A PROCESS FOR DIODE ARRAYS IS NOT ESTABLISHED, RELIABILITY IS POOR AND POWER OUTPUT IS OFTEN LOW AS A RESULT OF A LACK OF CONTROL OVER THE PROCESS.						
SOLUTION - USE LITHOGRAPHIC TECHNIQUES AND OTHER PROCEDURES FROM IC TECHNOLOGY TO ESTABLISH A PROCESS FOR ARRAYS WHICH OPERATE AT 10 MICRONS AND CAN BE USED TO PERFORM BEAM ENCODING FUNCTIONS.						
(1127) TITLE - ULTRA HIGH RESOLUTION INSPECTION SYSTEM FOR LSI				2000	2000	
PROBLEM - LARGE SCALE INTEGRATED(LSI)CIRCUITS INCLUDE MINIATURIZED COMPONENTS OF .001 INCHES OR LESS IN SIZE. INORDER TO INSPECT/DETECT CERTAIN FLAWS, TWINING STACKING, PATH METALIZATION ETC, A MINIMUM X-RAY RESOLUTION 1000 LINE PER INCH IS REQUIRED.						
SOLUTION - DEVELOP A PROTOTYPE ULTRA HIGH RESOLUTION LSI INSPECTION SYSTEM USING A RECENTLY DEVELOPED X-RAY IMAGING TECHNIQUE, FIBEROPTIC SCIENTILLATOR PANEL. THIS SYSTEM WILL BE A DIRECT VIEWING PROTOTYPE INSPECTION WITH 4000 LINES/INCH RESOLUTION						

CATEGORY
GENERAL

FUNDING ($000)

	PRIOR	83	84	85	86	87

COMPONENT -- MISCELLANEOUS

(1031) TITLE - ELIMINATE GOLD ON PWB CONTACTS AND CABLE PINS — 87: 620

PROBLEM - PROBLEMS INCLUDE BATH PLATING COVERAGE + THICKNESS, AMPS/SQ FT, BATH FILTRATION, INSPECTION + TEST AND METAL ALLOY RATIOS.

SOLUTION - DEVELOP + ESTABLISH MMT FOR PLATING USING NEW METALS OR ALLOYS. INVESTIGATE HIGH SPEED PULSE PLATING AND OPTIMIZE LINE EQUIPPED TOOLING.

(1055) TITLE - REMOVE GOLD FROM COMPONENT LEADS — 87: 150

PROBLEM - GOLD PLATING, USED ON MOST ACTIVE DEVICE LEADS MUST BE REMOVED BY MANUAL DOUBLE SOLDER DIPPING PER MIL STANDARDS. THIS IS SLOW AND COSTLY BUT NECESSARY TO PREVENT GOLD EMBRITTLEMENT OF SOLDER JOINTS WHICH COULD RESULT IN PREMATURE FAILURE.

SOLUTION - DEVELOP AN AUTOMATED MACHINE FOR REMOVING GOLD FROM COMPONENT LEADS BY THE REQUIRED DOUBLE SOLDER DIP METHOD.

(1063) TITLE - SEMIADDITIVE REEL TO REEL FLEX PRINT PROCESS — 87: 421

PROBLEM - CONVENTIONAL BATCH PROCESSING OF PRINTED WIRING BOARDS IS LABOR INTENSIVE. HAND LABOR IS BOTH COSTLY AND SUBJECT TO ERRORS WHICH ADDS REJECT LOSSES TO LABOR COSTS.

SOLUTION - A REEL TO REEL MFG PROCESS FOR PWB'S WILL PRODUCE COMPLETE PWB'S FROM REELS OF CLAD STOCK IN A SEQUENTIAL SET OF OPERATIONS. THE OUTPUT CIRCUITS WILL BE FLAT CABLE OR FLEXIBLE CIRCUITRY.

(1075) TITLE - ELECTRONICS COMPUTER AIDED MANUFACTURING (ECAM) — PRIOR: 800; 84: 1000; 85: 3300; 87: 3300

PROBLEM - ALTHOUGH INTEGRATED CIRCUITS, HYBRID CIRCUITS,PRINTED CIRCUITS AND CABLES ARE DESIGNED ON A COMPUTER, THERE IS LITTLE COMPUTERIZED CONTROL OF PROCESSES USED TO PRODUCE THESE ITEMS. A MASTER PLAN IS NEEDED TO DEFINE THE AREA AND REQUIREMENTS.

SOLUTION - DEVELOP A DOD MASTER PLAN FOR COMPUTER-AIDED DESIGN AND MFG OF ELECTRONIC SYSTEMS. USE AIR FORCE?S ICAM AND NASA?S IPAD PROGRAMS TO DEFINE CAD/CAM AND ELECTRONIC TECHNOLOGIES TO MAKE INTEGRATED CIRCUITS,HYBRID CIRCUITS,PRINTED CIRCUITS, AND CABLES.

(1101) TITLE - SINGLE CRYSTAL SILICON FOR VLSI — 87: 750

PROBLEM - SINGLE CRYSTAL SILICON PROCESSES AND MATERIALS ARE CURRENTLY PROPRIETARY.

SOLUTION - ESTABLISH A PROCESS GROWING 2-INCH DIAMETER SINGLE CRYSTALS.

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- MISCELLANEOUS (CONTINUED)							
(1102)	TITLE - LITHOGRAPH FOR MICROCIRCUIT CHIPS						1250
	PROBLEM - CURRENT METHODOLOGY FOR THE GENERATION OF PHOTO LITHOGRAPHY EQUIPMENT IS APPROACHING THE DIFFRACTION LIMIT OF LIGHT. THIS CONDITION RESULTS IN POOR PATTERN REPLICATION AND INCREASE IN DEFECTS.						
	SOLUTION - ESTABLISH AN X-RAY LITHOGRAPHY PROCESS WHERE REPRODUCTION OF PATTERNS UP TO 1 CM SQUARE ARE ACCURATE.						
(1103)	TITLE - STABLE MATERIALS + MANUFACTURING FOR MULTILAYER PWB			400			
	PROBLEM - MATERIAL FAILURE AND INTERLAYER MIS-REGISTRATION IN MULTILAYER CIRCUIT BOARDS INCREASES WITH THINNER BASE LAMINATES. SPECIFICATIONS FOR RAW MATERIALS AND CONTROL ON LAMINATES THAT WILL REDUCE BOARD STRESSES INTRODUCED BY BONDING ARE REQUIRED.						
	SOLUTION - ESTABLISH A RELATIONSHIP BETWEEN MATERIAL VARIABLES AND DIMENSIONAL STABILITY. APPLY DATA TO FOSTER MATERIALS AND BOARD FABRICATION METHODS THAT REDUCE FREQUENCY OF MISREGISTERED BOARDS AND BOARD FAILURE DUE TO MATERIAL FAILURE.						
(1109)	TITLE - ROBOTIZED WIRE HARNESS ASSEMBLY SYSTEM	1155		1000			
	PROBLEM - MANUAL HARNESS PROCEDURES UTILIZE SEVERAL STATIONS + SIGNIFICANT REPEATED MATERIAL HANDLING + TRANSFER. APPROXIMATELY 50 PERCENT OF FABRICATION TIME IS DEVOTED TO HANDLING, SORTING, AND IDENTIFICATION.						
	SOLUTION - AN INTEGRATED APPROACH TOWARDS WIRE HARNESS FABRICATION WILL USE A ROBOT ARM WITH 6 DEGREES OF FREEDOM TO INCORPORATE WIRE PREPARATION, HARNESS ASSY, AND TESTING INTO A SINGLE WORK STATION,						
(1117)	TITLE - ROBOTIC PRINTED WIRING BOARD (PWB) ASSEMBLY						450
	PROBLEM - PROBLEMS INCLUDE HIGH COSTS DUE TO SINGLE BOARD HANDLING THRU A SERIES OF AUTO COMPONENT INSERTION MACHINES AND THRU IN-LINE SOLDERING AND CLEANING EQUIPMENT.						
	SOLUTION - ESTABLISH MFG METHODS FOR A ROBOTIC CELL TO AUTOMATICALLY TRANSFER, LOAD + UNLOAD INSERTION MACHINES, SOLDER, CUT LEADS, CLEAN AND PACKAGE PWB ASSEMBLIES.						
(1135)	TITLE - LOW COST HEMISPHERICAL SHAPED CHARGES				2900	3950	750
	PROBLEM - THE R+D METHOD OF SHAPED CHARGE ASSEMBLY DOES NOT SUPPORT HIGH RATE PRODUCTION. THE INDUSTRIAL BASE FOR LINER PRODUCTION IS LIMITED TO ONE OR TWO FIRMS.						
	SOLUTION - A PRODUCTION PROCESS FOR FINAL LINERS OF VARIOUS SIZES WILL BE DEVELOPED AND DEMONSTRATED, STARTING WITH THE DU BILLET, AND ENDING WITH THE EXPLOSIVE LOADED HEMISPHERICAL LINER.						

		FUNDING ($000)				
	PRIOR	83	84	85	86	87
COMPONENT -- MISCELLANEOUS (CONTINUED)						
(3164) TITLE - COMPONENT SIDE PRINTED CIRCUIT BOARD SOLDERING						350
PROBLEM - THERE IS NO KNOWN METHOD FOR HOLDING COMPONENTS IN ALIGNMENT FOR MOUNTING.						
SOLUTION - REFINE PROCESS FOR FOIL SIDE MOUNTING OF COMPONENTS TO ACCOMODATE FLEXIBLE CIRCUITS.						
(3184) TITLE - SCREEN PRINTING PROCESSES FOR PTH ON PLASTIC PCB'S						350
PROBLEM - SET UP AND RUN TIME FOR ELECTROLESS COPPER PLATED THRU HOLES (PTH) IS APPROXIMATELY 3.75 MIN PER BOARD WITHOUT INSPECTION OR MAINTENANCE.						
SOLUTION - SCREEN PRINTING COULD ACCOMPLISH THE SAME JOB IN APPROXIMATELY .48 MIN PER BOARD. INVESTIGATE CURING CYCLE, SCREEN PREPARATION TIME, AND PASTE THEOLOGY FOR OPTINUM FLOW THRU HOLES.						
(3233) TITLE - COMPUTERIZED INTEGRATED MANUFACTURING SUPPORT (CAM)						500
PROBLEM - MANUFACTURING SYSTEMS MUST BECOME MORE PRODUCTIVE, FLEXIBLE AND PRECISE AND BETTER ABLE TO COPE WITH VARYING REQUIREMENTS.						
SOLUTION - ESTABLISH A SYSTEM DESIGN RELATING INPUT, OUTPUTS, FORMATS, AND DATA TO MEET REQUIREMENTS OF THE TOTAL DESIGN TO USE PROGRESSION.						
(3238) TITLE - MANUFACTURING COST ANALYSIS (CAM)						200
PROBLEM - THERE IS A NEED TO DEFINE AND CONTROL AQUISTION PROGRAM COST DURING CONTRACT DEFINITION AND DEVELOPMENTAL PHASES.						
SOLUTION - STRUCTURE COMPUTER MODEL TO CALCULATE THE LABOR CONTENT OF A DESIGN CONCEPT IN STANDARD SETUP AND RUN TIME.						
(3369) TITLE - UTILIZATION OF LARGE SCALE INTEGRATION (LSI) TECHNIQUES						400
PROBLEM - THE DESIGN AND UTILIZATION OF LSI ELECTRONICS IN AN ADVANCED DEVELOPMENT PROGRAM IS NOT FEASIBLE BECAUSE OF THE INABILITY TO MAKE QUICK CHANGES.						
SOLUTION - CONDUCT PROJECT FOR LSI DEVELOPMENT, QUALIFICATION, PRODUCTION ENGINEERING AND PILOT RUN FOR THE STINGER ALTERNATE MISSILE GUIDANCE ELECTRONICS.						

CATEGORY
GROUND SUPPORT EQUIPMENT

		FUNDING ($000)				
	PRIOR	83	84	85	86	87
COMPONENT -- CIRCUITRY						
(1105) TITLE - PRODUCTON METHODS FOR A LOW SIDELOBE ANTENNA NETWORK						280
PROBLEM - CURRENT MANUFACTURE OF AIR STRIPLINE NETWORKS FOR LOW SIDELOBE ANTENNA ARE EXPENSIVE BECAUSE OF LARGE BOARD SIZE WITH ACCURATE DIMENSIONAL TOLERANCE REQUIREMENTS.						
SOLUTION - ESTABLISH METHODOLOGY REDUCING THE LINE LENGTH TRIMMING. AUTOMATE PLACEMENT AND SOLDERING OF ISOLATION RESISTORS AND THE PLACEMENT OF GROUND PLANE SPACORS REDUCING HAND LABOR.						
(1131) TITLE - AN INTEGRATED 94 GHZ SUBMUNITIONS TRANSCEIVER				725	1075	
PROBLEM - THE TRANSCEIVER IS VERY EXPENSIVE DUE TO THE LABOR REQUIRED TO MATCH, ALIGN AND TEST COMPONENTS AND TO INTEGRATE THESE COMPONENTS INTO A TRANSCEIVER WHICH HAS THE REQUIRED PERFORMANCE.						
SOLUTION - EQUIPMENT FOR A DEPOSITION PROCESS DEVELOPED AT ERADCOM WILL BE ASSEMBLED TO PLACE TRANSMISSION MEDIA AND DEVICES ON A SUBTRATE BASE. THIS EQUIPMENT AND THE PROCEDURES FOR IT WILL CONTROL THE CRITICAL TOLERANCES REQUIRED.						
(1133) TITLE - CROSSED FIELD AMPLIFIER (CFA) TECHNOLOGY				1316	412	
PROBLEM - CFA TUBE COSTS ARE EXCESSIVE DUE TO EMISSION DELAY, HIGH SPURIOUS NOISE, PEAK POWER DIP, AND FULL PULSE OSCILLATION AT THE 180 DEGREE PHASE SHIFT FREQUENCY. NEW TECHNIQUES ARE NEEDED FOR A MORE REPRODUCIBLE DEVICE.						
SOLUTION - IMPROVEMENTS TO CFA TUBES WOULD- A. INCREASE PLATINUM CATHODE SIZE. B. CHANGE WAVEGUIDE OPENING FROM RECTANGULAR TO CIRCULAR. C. BRAZE SHORT STRIPS TO TUBE?S SLOW WAVE STRUCTURE. D. ADD INPUT FILTER IN THE WAVEGUIDE.						

CATEGORY
GUIDANCE SYSTEM

COMPONENT -- GENERAL						
(1094) TITLE - PROD METH F/MILLIMTR MONOPULSE ANTENNA F/DIR FIRE APPL						1815
PROBLEM - SENSOR ANTENNA SYSTEM NEEDS RELATIVE ALIGNMENT FACTORS BETWEEN DIELECTRIC LENS, MOVABLE REFLECTOR AND ACTIVE ANTENNA ELEMENT REQUIRING ANTENNA FEED UNITS BUILT BY HAND.						
SOLUTION - ESTABLISH METHODLOGY FOR CONSTRUCTING MONOPULSE ANTENNA INTO A COMPATIBLE PACKAGE WITH A 5 MILLIRADIAN BEAM WIDTH AT 94 GHZ.						

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- GYROS							
(1114)	TITLE - IMPROVING THE FABRICATION PROCESSES FOR MICRO-OPTIC GYRO						300
	PROBLEM - MANUAL LABOR AND MATERIAL CUTTING IN PRODUCTION OF MEDIUM ACCURACY (1-10 DEG/HR DRIFT) RATE SENSORS LEAD TO HIGH UNIT COSTS. METHODS TO INTEGRATE SOLID STATE COMPONENTS + PROCESS THE ELECTRONICS ARE NOT ESTABLISHED.						
	SOLUTION - PROVIDE METHODS FOR DEPOSITING THE SOLID STATE COMPONENTS ON A SUITABLE SUBSTRATE. THIS INVOLVES DETERMINING THE OPTIMUM SEQUENCE AND TIMING FOR THE ASSEMBLY PROCEDURE.						
COMPONENT -- INTEGRATED ELECTRONICS							
(1056)	TITLE - MILLIMETER WAVE OSCILLATORS FOR MONOPULSE RECEIVERS						500
	PROBLEM - DEVELOPMENT OF A 140 GHZ GUIDANCE SYSTEM IS HAMPERED BY HIGH COST AND LOW EFFICIENCY OF THE MACHINED WAVEGUIDE VARACTOR MULTIPLIERS. GUNN OSCILLATORS, THE ONLY PRACTICAL ONE FOR INPUT, HAS BORDERLINE POWER LEVELS.						
	SOLUTION - USE THE SEMI-ADDITIVE PWB MFG PROCESS TO ELECTROPLATE SILVER ON LOW LOSS SUBSTRATES TO FORM 1) A LOW FREQUENCY INPUT BAND PASS FILTER MATCHING THE GUNN, 2) A NON LINEAR VARACTOR ELEMENT, AND 3) A HIGH FREQUENCY OUTPUT BAND PASS AT 140 GIGAHERTZ.						
(1093)	TITLE - PRODUCTION METHODS FOR A MILLIMETER MODULAR TRANSPONDER						650
	PROBLEM - TRANSPONDERS NOW REQUIRE MUCH HAND FABRICATION LABOR AND ARE HIGH COST. THEY ARE USED ONLY ONCE. THEY MUST RECEIVE A GUIDANCE RADAR SIGNAL, DECODE IT, FORM A CODED REPLY AND TRANSMIT IT TO THE GUIDANCE RADAR. MUST WITHSTAND A HIGH-G ENVIRONMENT.						
	SOLUTION - REDUCE CONFIGUATION TO A FORM THAT MINIMIZES MFG COST. MODULARIZE TRANSPONDER BY FUNCTION ANTENNA MODULE, RECEIVER MODULE, DECODING MODULE, ENCODING MODULE, TRANSMITTER MODULE, POWER SUPPLY MODULE. BUILD MODULES TO FIT IN A FOUR INCH MI. USE LSI.						
(3177)	TITLE - IMPROVED MANF. PROCESS FOR SUBMISSILE ELECTRONIC SUBSYSTEM						250
	PROBLEM - PRESENT MANUFACTURING PROCESSES SUBSTANTIALLY INCREASE THE COST OF HOMING SUBSYSTEMS.						
	SOLUTION - INVESTIGATE VOLUME METHODS FOR PRODUCING ELECTRONIC HOMING SUBSYSTEMS.						

		FUNDING ($000)				
	PRIOR	83	84	85	86	87
COMPONENT -- OPTICS						
(1054) TITLE - MFG PROCESS FOR HOLOGRAPHIC OPTICAL COMPONENTS						375
PROBLEM - FABRICATION TECHNIQUES FOR HOLOGRAPHIC OPTICAL COMPONENTS ARE LIMITED TO LAB SAMPLES OF SELECTED OPTICAL COMPONENTS. LIMITATIONS ON SYSTEM PERFORMANCE WHEN THE TECHNOLOGY IS TRANSFERRED FROM THE LAB TO PRODUCTION IS NOT KNOWN.						
SOLUTION - ESTABLISH A PILOT PROCESS FOR MAKING HOLOGRAPHIC OPTICAL ELEMENTS WHICH WILL BE USED TO DETERMINE AND OVERCOME THESE LIMITATIONS.						
(1097) TITLE - LOW MASS FIBER CONDUCTOR					350	350
PROBLEM - PRESENT CHIP AND WIRE TECHNOLOGY USES 1 MIL GOLD OR ALUMINUM WIRE FOR INTERCONNECTING IC CHIPS TO HYBRID SUBSTRATES. A 1 MIL SYNTHETIC FIBER WOULD PRECLUDE MOST BOND INTERFACE FAILURES. FIBER RESISTIVITY, DIA + COMPATIBLE EPOXIES ARE PROBLEMS.						
SOLUTION - VARIOUS SYNTHETIC FIBERS, CONDUCTIVE EPOXY BONDING, + METALLIC PLATING WILL BE EVALUATED. SUITABLE BONDING EQUIPMENT WILL BE ESTABLISHED + COORDINATED WITH OPTIMUM FIBER CONDUCTOR.						
(1132) TITLE - SINGLE MODE FIBER FOR FOG LINK				375	475	
PROBLEM - MILITARY QUALIFIED 10 MICRON CORE OPTICAL FIBERS ARE NOT AVAILABLE IN THE REQUIRED QUANTITIES.						
SOLUTION - IMPROVE QUALITY CONTROL AND INSPECTION PROCEDURES FOR THE PERFORM. DRAWING TOWER CONTROLS, SENSORS AND PROCEDURES WILL BE IMPROVED.						
(1139) TITLE - IMAGE FORMING LIGHT MODULATORS				400	1139	
PROBLEM - PRODUCTION PROCESSES ARE NEEDED FOR LIGHT MODULATORS (TRANSDUCERS) THAT CONVERT INCOHERENT DETECTO OUTPUT INTO COHERENT LIGHT FOR TRANSMISSION ON A FIBER OPTIC CABLE.						
SOLUTION - PHOTOCONDUCTOR BATCH PROCESSING CONSISTING OF 10 SEPARATE STEPS WILL BE DEVELOPED. NEW METHODS WILL BE INTRODUCED FOR SUBSTRATE GRINDING AND POLISHING, FIXTURING AND LOADING. AN AUTOMATED TEST STATION WILL BE DEVISED.						
(3152) TITLE - PRODUCTION OF OPTICAL ELEMENTS (CAM)						300
PROBLEM - HIGH GRADE OPTICS IN MODERATE QUANTITY CANNOT BE PRODUCED AT LOW COST WITH REPEATABILITY.						
SOLUTION - APPLY COMPUTER CONTROL TO PROCESS OPERATIONS WITH SENSOR CONTROL AND PROCESS FEEDBACK TO ASSURE HIGH YIELD.						

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- RADOMES							
(3176)	TITLE - MANUFACTURE OF SILICON NITRIDE RADOMES						390
	PROBLEM - THERE IS NO EXISTING ECONOMICAL MANUFACTURING PROCESSES FOR LARGE RADOMES FROM CURRENT MATERIALS.						
	SOLUTION - SLIPCAST SILICON POWDER AND FIRE THE RADOME IN A NITROGEN ATMOSPHERE.						
COMPONENT -- SEEKERS							
(1064)	TITLE - PRODUCTION OF INFRARED SEEKER ELECTRONICS USING VLSI (CAM)						400
	PROBLEM - LOW COST, LIGHT WEIGHT, MINIMUM VOLUME GUIDANCE ELECTRONICS ARE REQUIRED FOR FUTURE FIRE AND FORGET MISSILE SYSTEMS. CURRENT PACKAGING USES DISCRETE COMPONENTS AND HERMETICALLY SEALED ENCLOSURES WITH CIRCUITS ON PC BOARDS ON MOTHERBOARDS IN HOUSINGS.						
	SOLUTION - USE FOUR OR FIVE STANDARD CHIPS FROM DOD PROGRAM IN VLSI (VERY LARGE SCALE INTEGRATED CIRCUITS) TECHNOLOGY AND DEVELOP MANUFACTURING PROCESSES TO PRODUCE INFRARED IMAGING SEEKER ELECTRONICS USING THIS TECHNOLOGY.						
(1079)	TITLE - WIDE AREA MERCURY-CADMIUM-TELERIDE QUADRENT DETECTORS						350
	PROBLEM - LARGE AREA MERCURY-CADMIUM-TELLURIDE QUANDRENT DETECTORS FOR IR SEEKERS ARE EXPENSIVE BECAUSE OF HIGH MATERIAL COST AND LOW YIELD. THE MATERIAL IS HARD TO GROW TO THE RIGHT CHEMICAL BALANCE. SLICING, ION IMPLANTATION AND/OR DIFFUSION ARE TOUCHY.						
	SOLUTION - FIND THE EXACT CHEMISTRY FOR GOOD DETECTOR OUTPUT. LOOK AT CLOSED LOOP COMPUTER CONTROL OF CRYSTAL PULLING. OPTIMIZE X-RAY CHARACTERIZATION, SAWING, POLISHING, ION IMPLANTATION, AND TESTING.						
(1083)	TITLE - IMP MFG PROC F/FOUR-IN DIAMETER FOCAL PLANE ARRAY SEEKERS						1000
	PROBLEM - STARING FOCAL PLANE ARRAY DETECTORS MAKE REDUCTION IN INFRARED SEEKER MECHANICAL COMPLEXITY AND SIZE NOT PREVIOUSLY POSSIBLE. ACHIEVEING HIGH PRODUCTION RATE WITH HIGH YIELD IN FABRICATION OF THIS NEW TYPE SEEKERHEAD IS A PROBLEM						
	SOLUTION - ESTABLISH MANUFACTURING PROCEDURES FOR LARGE VOLUME HIGH YIELD PRODUCTION OF STARING FOCAL PLANE ARRAY DETECTORS AND SMALL DIAMETER SEEKERHEADS.						
(1104)	TITLE - IMPROVED SANDWICH DETECTOR FABRICATION FOR INFRARED SEEKERS				400	400	
	PROBLEM - FABRICATING TWO DETECTORS INTO A SANDWICH CAUSES LOWER SENSITIVITY, CROSS TALK, POOR TRANSMISSION, AND PROVIDES A DETECTOR TO THICK FOR A COMMON FOCUS.						
	SOLUTION - FABRICATE THE SANDWICH DETECTOR FROM ONE PIECE OF MATERIAL THUS ELIMINATING THE 2 PIECE MATERIAL/MECHANICAL BOND PROBLEM. THE EFFORT WILL INCLUDE GROWING THE DETECTOR AS A UNIT, NEW LEAD ATTACHMENT AND DEWAR INTEGRATION,						

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- SEEKERS (CONTINUED)							
(1141)	TITLE - LOW COST TV SEEKER				400	400	
	PROBLEM - THE FOG-M MISSILE TV SEEKER IS A HIGH COST SUBASSEMBLY. THE HIGH COST OF MATERIAL, HAND LABOR AND TESTING AS WELL AS EXPENSIVE MACHINING METHODS CONTRIBUTE ARE TO BLAME. THERE ARE PROBLEMS WITH ENVIRONMENTAL PERFORMANCE.						
	SOLUTION - CORRECT SELECTION OF LOW COST MATERIAL, AUTOMATION OF TESTING, SELECTION OF MACHINING ALTERNATIVE AND REDESIGN OF THE SEEKER WILL ENABLE LOW COST PRODUCTION.						
(3178)	TITLE - IMPROVED MANUFACTURING PROCESSES FOR LASER IR/OPTICAL SEEKER						250
	PROBLEM - FIBER OPTICS FIXTURE ARE DIFFICULT AND EXPENSIVE TO MAKE.						
	SOLUTION - REDUCE FIBER OPTICS FIXTURE DIFFICULTIES BY DEVISING METHODS TO REDUCE HANDLING OF FIBER FIXTURE AND DETECTOR ARRAY.						
(3427)	TITLE - IMPROVED MANF. TECH. FOR THE MULTI-ENVIRONMENT ACTIVE SEEKER				600	600	
	PROBLEM - DIODE ARRAY TRANSMITTER, POLARIZATION ANTENNA, AND ACOUSTIC WAVE DEVICES USED IN THIS SEEKER ARE PRESENTLY BUILT BY PROTOTYPE SHOP METHODS.						
	SOLUTION - ESTABLISH METHODS FOR PRODUCING THESE CRITICAL COMPONENTS SO THAT PERFORMANCE PARAMETERS CAN BE CLOSELY CONTROLLED.						
(3428)	TITLE - IMPROVED TECHNIQUES FOR COMMON APERTURE MULTISPECTRUM SEEKER						259
	PROBLEM - PRESENT METHODS FOR MAKING WIDE BAND ON A ONE AT A TIME BASIS, DOES NOT PERMIT GOOD CONTROL OF PERFORMANCE.						
	SOLUTION - MANUFACTURING TECHNIQUES ARE REQUIRED TO PRODUCE THESE COMPONENTS IN MODERATE QUANTITIES WITH CLOSER TOLERANCES.						
COMPONENT -- SENSORS							
(1053)	TITLE - MFG PROCESS FOR INFRARED FOCAL PLANE ARRAY						550
	PROBLEM - THE GREATEST OPPORTUNITY FOR FABRICATION OF INFRARED FOCAL PLANE ARRAYS IS TO MATE AN ARRAY OF IR DETECTORS TO A SILICON CHARGE COUPLED DEVICE. HOWEVER PROBLEMS ARE ENCOUNTERED IN ACHIEVING A RELIABLE INTERFACE BETWEEN THE CCD AND ARRAY OF DETECTORS.						
	SOLUTION - DEVELOP A PROCESS THAT WILL ALLOW AN INDIUM BUMP ON THE BACKSIDE OF EACH ELEMENT OF AN IR ARRAY WHICH CAN BE JOINED IN GOOD ELECTRICAL AND MECHANICAL CONNECTION WITH THE TERMINAL OF AN ELEMENT OF A CCD SIGNAL PROCESSING ARRAY.						

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- SENSORS (CONTINUED)							
(1098)	TITLE - LARGE DIAMETER SILICON						160
	PROBLEM - MILITARY REQUIREMENTS FOR DETECTORS ARE EXCEEDING STANDARD SIZES. SPECIAL TOOLING AND REPLACEMENT PARTS CREATE A PREMIUM ON COST AND TIME DELAYS.						
	SOLUTION - INVESTIGATE ETCHING, ULTRASONIC CAVITATION, LASER SCRIBING, SAWING AND TREPANNING FOR CUTTING .8 IN DISCS FROM 3 IN WAFERS. REDUCE STRESS AND PREVENT FAILURES.						
(1120)	TITLE - DETECTOR GRADE CADMIUM SULFIDE (CDS)				300	450	
	PROBLEM - CURRENTLY AVAILABLE PROCESSES FOR PRODUCING CADMIUM SULFIDE CRYSTALS OFTEN RESULT IN SMALL BOULE SIZES THAT LOSE CRYSTALLINITY, LARGE RESISTIVITY VARIATIONS, AND HIGH DEN[illegible] OF CRYSTALINE FLAWS.						
	SOLUTION - ESTABLISH A GROWTH PROCESS FOR CDS CRYSTAL THAT ALLOWS FOR AN INCREASED BOULE SIZE THAT MAINTAINS CRYSTALLINITY. A NEW SEMI-CLOSED TUBE VAPOR PHASE TRANSPORT METHOD WHICH CAN GROW CRYSTALS W/ LOW FLAW DENSITY IS ONE POSSIBILITY.						
(1123)	TITLE - IMPROVED MFG PROCESSES STARING FOCAL PLANE ARRAY DETECTORS					2000	4000
	PROBLEM - THERE IS NO METHOD FOR MAKING A STARING 128X128 FOCAL PLANE ARRAY FOR SEEKERS THAT INCLUDES THE SIGNAL PROCESSING AND DEWAR ASSEMBLY. PRESENTLY, UNITS ARE HAND-MADE WITH ATTENDANT HIGH COSTS. LONGER LIFE DEWARS ARE NEEDED.						
	SOLUTION - THE DETECTOR MATERIAL WILL BE MADE IN 10 MICRON THICK WAFERS BY THE LIQUID PHASE EPITAXY PROCESS. A METHOD WILL BE DEVELOPED TO FORM THE ARRAY AND ATTACH IT TO THE PROCESSING CHIPS AND DEWAR ASSEMBLY.						
(1124)	TITLE - IMPROVED MFG PROC F/8-10 MICRON SCANNING TDI FPA DETECTORS				2000	4000	2000
	PROBLEM - THERE IS NO PRODUCTION METHOD FOR MAKING A SCANNING FOCAL PLANE ARRAY FOR SEEKERS THAT INCLUDES THE SIGNAL PROCESSING AND DEWAR ASSEMBLY. PRESENTLY, UNITS ARE HAND-MADE WITH ATTENDANT HIGH COSTS. LONGER LIFE DEWARS ARE NEEDED						
	SOLUTION - THE DETECTOR MATERIAL WILL BE MADE IN 10 MICRON THICK WAFERS BY THE LIQUID PHASE EPITAXY PROCESS. A METHOD WILL BE DEVELOPED TO FORM THE ARRAY AND ATTACH IT TO THE PROCESSING CHIPS AND DEWAR ASSEMBLY.						
(3175)	TITLE - MANUFACTURING PROCESSES FOR SOLID STATE IMAGING SENSORS						300
	PROBLEM - EXISTING PROCESSES ARE LOW YIELD AND NON-UNIFORM, MECHANICAL VAPOR DEPOSITION MUST BE OPTIMIZED.						
	SOLUTION - ESTABLISH THE PROCESSES CIRCUMVENTING PRESENT PROBLEMS ON WIRE BONDING, TWEAKING, TESTING, ETC.						

		FUNDING ($000)				
	PRIOR	83	84	85	86	87
COMPONENT -- WINDOWS/RADOMES						
(1069) TITLE - MANUFACTURE OF GRADIENT INDEX LENSES						300
PROBLEM - MILITARY OPTICAL SYSTEMS ARE HEAVY, AWKWARD, EXPENSIVE AND DIFFICULT TO MAINTAIN ALIGNMENT. ASPHERIC LENSES HAVE COMPLEX SHAPES REQUIRING SPECIAL POLISHING TECHNIQUES WHICH CAUSE THE LENSES TO BE COSTLY.						
SOLUTION - ESTABLISH MANUFACTURING PROCESS FOR THE PRODUCTION OF OPTICAL QUALITY GRADIENT INDEX LENSES.						
(1118) TITLE - NITRIDE-BASED MILLIMETER ANTENNA WINDOW AND RADOMES						300
PROBLEM - ULTRA-HIGH PURITY NITRIDE-BASED CERAMICS ARE EXPENSIVE IN LIEU OF A MANUFACTURING PROCESS AND ESTABLISHED CUTTING/POLISHING TOOLING THAT CAN RESULT IN HIGH CONFIDENCE STRUCTURAL PROPERTIES AND RADAR HOT TRANSMISSION.						
SOLUTION - HIGH THROUGHPUT FURNACES AND GAS FLOW FIXTURING WILL BE DEVELOPED FOR CHEMICAL VAPOR DEPOSITION (CVD) OF SILICAN NITRIDE AND ALUMINUM NITRIDE RADOMES. HOT ISOSTATIC PROCESSING OF CVD POWDERS WILL ALSO BE DEVELOPED FOR PRODUCTING FULL SCALE RADOMES.						
(1119) TITLE - COMPOSITE MILLIMETER ANTENNA WINDOW						675
PROBLEM - A MANUFACTURING SCALE PROCESS FOR 4D SILICA-SILICA AND ALUMINA-ALUMINA MULTIDIMENSIONAL COMPOSITES IS NOT AVAILABLE. WORK IS NECESSARY IN TOOLING DESIGN FOR SCALE-UP OF THE WOVEN PREFORM IN PARTICULAR.						
SOLUTION - THE PREFORM WEAVING PROCESS FOR THE FULL SCALE RADOME WILL BE AUTOMATED USING THE RIGID ROD TECHNOLOGY DEMONSTRATED FOR CARBON/CARBON COMPONENTS. MANUFACTURING QUALITY ASSURANCE METHODS WILL ALSO BE ESTABLISHED.						
(1122) TITLE - PRODUCTION OF HIGH PERFORMANCE LOW COST CERAMIC IR DOMES				450	350	
PROBLEM - OPTICAL GUIDANCE SYSTEMS FOR HIGH PERFORMANCE MISSILE SYSTEMS WILL REQUIRE CERAMIC DOMES. THE ONLY MATERIAL CURRENTLY AVAILABLE, SINGLE CRYSTAL SAPPHIRE, REQUIRES SPECIAL PROCESSING FACILITIES AND EXPENSIVE SECONDARY OPERATIONS.						
SOLUTION - BASED ON THE RESULTS OF ONGOING RESEARCH ACTIVITY, A MATERIAL WILL BE SELECTED FOR FABRICAION USING FORM TO SHAPE PROCESSES.						
(1124) TITLE - RF/LASER HARDENING OF DOMES FOR DUAL MODE SYSTEMS				750	750	
PROBLEM - CURRENT MISSILE DOMES ARE NOT HARDENED TO RFI AND LASER THREATS WHILE RETAINING THE ABILITY TO OPERATE IN SPECIFIC SPECTRAL BANDS.						
SOLUTION - MULTIPLE LAYERS OF TIN TELLURIDE AND GOLD WILL BE DEPOSITED IN THE MISSILE DOMES AS WELL AS FINE LINE CONDUCTIVE GRID PATTERNS.						

AD-A134 271 MANUFACTURING METHODS AND TECHNOLOGY PROGRAM PLAN CY 1983(U) ARMY INDUSTRIAL BASE ENGINEERING ACTIVITY ROCK ISLAND IL G FISCHER SEP 83 3/3

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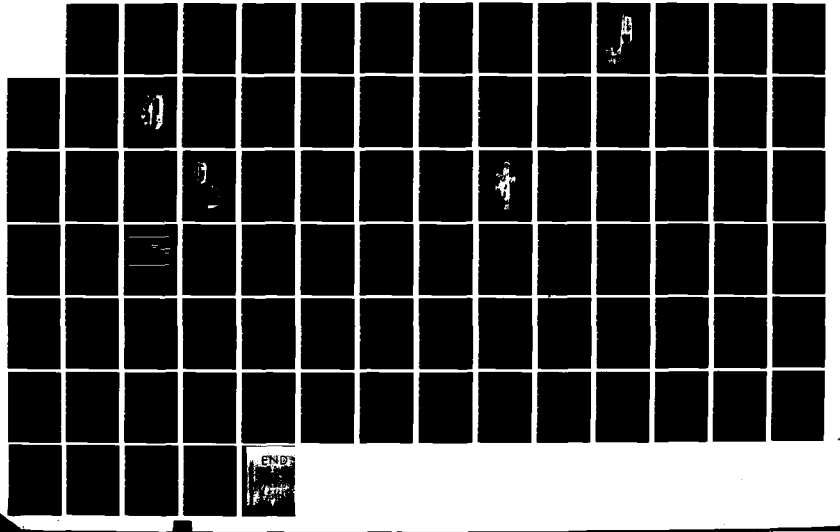
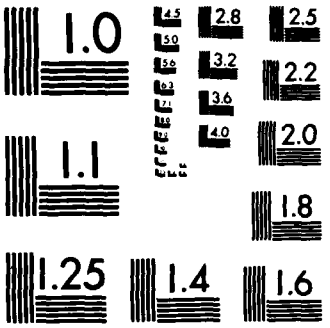




	FUNDING ($000)					
	PRIOR	83	84	85	86	87
COMPONENT -- WINDOWS/RADOMES (CONTINUED)						
(1137) TITLE - IMPROVED INFRARED TRANSMITTING DOME F/ARMY MISSILES					1200	1400
PROBLEM - CURRENT STINGER-POST DOMES ARE EXPENSIVE, IMPORTED AND SHOW POOR PERFORMANCE BECAUSE IT IS HYGROSCOPIC.						
SOLUTION - DOMESTIC SOURCED GERMANATE GLASS WILL BE MOLDED INTO DOMES. THIS WILL CUT COSTS, IMPROVE PERFORMANCE AND SIMPLIFY MAINTENANCE.						
(1140) TITLE - LASER/RF HARDENING EO/IR + DIRECT VIEW SENSORS				400	400	
PROBLEM - CURRENT MISSILE DOMES ARE NOT HARDENED TO RFI AND LASER THREATS WHILE RETAINING THE ABILITY TO OPERATE IN SPECIFIC SPECTRAL BANDS.						
SOLUTION - MULTIPLE LAYERS OF TIN TELLURIDE AND GOLD WILL BE DEPOSITED IN MISSILE DOMES AS WELL AS FINE LINE CONDUCTIVE GRID PATTERNS.						
(1143) TITLE - LASER SYSTEM E-GUN IMPROVEMENT						600
PROBLEM - ALUMINUM FOIL WINDOWS USED IN ELECTRIC DISCHARGE CO-2 LASERS MUST BE OF UNIFORM THICKNESS AND COOLED AROUND THE PERIMETER WITH A CHANNEL CONDUCTING DE-IONIZED WATER. THE FOIL MUST BE OF UNIFORM COMPOSITION, STRENGTH + THICKNESS.						
SOLUTION - FORM ALUMINUM FOIL TO UNIFORM THICKNESS AND COOL IT WITH A RADIATOR RIM CARRYING DE-IONIZED WATER. THE WINDOW IS A SMALL RECTANGLE OF THIN FOIL WHICH PERMITS THE ELECTRIC DISCHARGE TO FLOW THROUGH AND IMPART ENERGY TO THE CARBON DIOXIDE GAS.						

CATEGORY

INTEGRATED ELECTRONICS

COMPONENT -- CIRCUITRY						
(1061) TITLE - STANDARDIZED MASKING TECHNIQUES FOR PWB ASSEMBLIES						250
PROBLEM - NO STANDARDIZED CONFORMAL MASKING TECHNIQUES ARE IN EXISTENCE THROUGHOUT INDUSTRY. MATERIALS AND TECHNIQUES ARE SELECTED BY PERSONNEL ACCORDING TO THEIR OWN JUDGEMENT PRIOR TO CONFORMAL COATING. DAMAGE RESULTS WHEN WRONG JUDGEMENT WAS USED.						
SOLUTION - DEVELOP STANDARDIZED MASKING MATERIALS AND TECHNIQUES BASED UPON WHICH TYPE OF AREAS ON THE PWB ASSEMBLY ARE TO BE FREE OF CONFORMAL COATING. PARAMETERS SUCH AS TERMINAL GEOMETRY, HOLE PATTERNS, HEAT SINK ZONES WILL BE EVALUATED.						

		FUNDING ($000)				
	PRIOR	83	84	85	86	87
COMPONENT -- CIRCUITRY (CONTINUED)						
(1062) TITLE - PREVENTING BRITTLE COPPER CIRCUITRY						380
PROBLEM - BRITTLE CLADDING FOIL AND BRITTLE ELECTRODEPOSITED COPPER FOR PWB'S IS A PREVALENT PROBLEM. NO PROCEDURE EXISTS FOR THE EARLY DETECTION OF EMBRITTLEMENT IN COPPER ELECTRODEPOSITS.						
SOLUTION - MEASURE THE DUCTILE-TO-BRITTLE TRANSITION IN COPPER DEPOSITS. THE MEASUREMENT OF BRITTLE TRANSITION PROVIDES A MEANS FOR THE EARLY DETECTION OF THE CHANGE FROM DUCTILE TO BRITTLE.						
(1065) TITLE - PROD OF QUIET RADAR SIGNAL PROCESSORS USING VLSI TECHNOLOGY					450	550
PROBLEM - THE MAN TECH BASE TO PRODUCE RADAR SIGNAL PROCESSORS USING VHSI (VERY HIGH SPEED INTEGRATED CIRCUITS) DOES NOT EXIST. METHODS USING LSI (LARGE SCALE INTEGRATED) CHIPS ARE INADEQUATE. HOWEVER, SOME TECHNIQUES MAY BE TRANSLATABLE TO VLSI.						
SOLUTION - POTENTIAL SOLUTIONS SUCH AS COMPUTER-AIDED TESTING OF THE INTERCONNECTED DEVICES, MICROWAVE STRIP-LINE TECHNOLOGY FOR DEVICE INTERCONNECTIONS, AND CUSTOM HEAT SINKS FOR VLSI/VHSIC WILL BE INVESTIGATED.						
(1066) TITLE - ADDITIVE SINGLE AND MULTILAYER HYBRID CIRCUITRY				450	450	
PROBLEM - THICK FILM CIRCUITRY USES THE SCREEN AND FIRE PROCESS ON CERAMIC SUBSTRATES. A SEMIADDITIVE FINE-LINE PROCESS, ELECTROLESS COPPER PLATING, USED ON FIBERGLASS AND CERAMIC SUBSTRATES WILL PROVIDE BETTER FINE-LINE AND A COST REDUCTION.						
SOLUTION - LAMINATE SURFACE CONDITIONS AND ELECTROLESS COPPER CATALYST STRENGTHS WILL BE INVESTIGATED. VARIATIONS IN PROCESSING PARAMETERS WILL BE EVALUATED. SOFTWARE TECHNIQUES FOR AUTOMATION OF MANUFACTURING PROCESSES WILL BE DEVELOPED.						
(1072) TITLE - MULTIPLE HIGH RELIABILITY/LOW VOLUME LSI MFG	1540	1000	1200			
PROBLEM - PRESENT PROCESSES FOR LSI CIRCUITS DO NOT ADEQUATELY SUPPORT MILITARY NEEDS. LSI MFG FACILITIES ARE STRUCTURED TO HANDLE HIGH VOLUME RUNS IN A SINGLE PROCESS TECHNOLOGY.						
SOLUTION - UTILIZING THE CONCEPT OF GROUP TECHNOLOGY, A LINE OF MODULAR TYPE EQUIPMENT WILL AUTOMATE AND CONTROL THE PROCESSES THROUGH A CENTRALIZED COMPUTER. THIS SYSTEM WILL HANDLE MULTIPLE LSI TYPES INVOLVING MULTIPLE TECHNOLOGIES.						
(1090) TITLE - ION IMPLANTED THIN FILM TRANSISTORS						350
PROBLEM - PROCESSES FOR MANUFACTURING THIN FILM TRANSITORS PRODUCE INCONSISTENT RESULTS DUE TO INABILITY TO CONTROL THE GEOMETRIES AND ELECTRICAL PROPERTIES OF THE MATERIAL.						
SOLUTION - USE ION IMPLANTATION TECHNIQUES TO SECURE CONTROLLED AND STABLE PROPERTIES OF THE SEMI-CONDUCTOR ELEMENT IN THIN FILM TRANSISTORS. THIS PROCESS WOULD PROVIDE AN ESTIMATED 20 TO 40 PERCENT INCREASED YIELD.						

		FUNDING ($000)				
	PRIOR	83	84	85	86	87
COMPONENT -- CIRCUITRY (CONTINUED)						
(1091) TITLE - ELIM OF PRECIOUS METALS MICROCIRCUIT APPLICATIONS						2000
PROBLEM - ELIMINATE USE OF NOBLE OR PRECIOUS METALS BY ESTABLISHING A THICK FILM PASTE USING BASE METAL AS A COPPER OR NICKEL IN THE FABRICATION PROCESS OF MICROCIRCUIT PACKAGES.						
SOLUTION - USE NON-NOBLE METALS ELIMINATING THE REQUIREMENTS FOR GOLD. APPLICATION OF NON-NOBLE METALS WOULD BE ESTABLISHED BY DETAILED ANALYSIS OF MATERIAL COMPATABILITY.						
(1095) TITLE - AUTOMATIC SEALING OF HYBRIDS						1550
PROBLEM - HYBRID CIRCUIT ASSEMBLIES FOR MILITARY USE REQUIRE HERMATIC SEALING WHICH IS ACCOMPLISHED BY SOLDERING OR WELDING. BOTH TECHNIQUES REQUIRE AN OPERATOR, INVOLVING LABOR INTENSIVE HANDLING AND SET UP ERRORS.						
SOLUTION - ESTABLISH AN AUTOMATIC HERMATIC SEALING SYSTEM USING A COMPUTER OR MICROPROCESSOR BASE AND BY MODIFYING EXISTING HERMATIC SEALING EQUIPMENT.						
(1099) TITLE - MFG METH AND TECH P/PIN DIODES AT MILLIMETER WAVE FREQUENCY						300
PROBLEM - CURRENT MANUFACTURE TECHNIQUES FOR DIODES ARE LIMITED BY WAFER SIZE AND BONDING. OTHER PROBLEMS INCLUDE METAL SYSTEMS WITH BONDING AND ETCHING, SAWING, LAPPING AND POLISHING FOR PRECISE DIMENSIONS.						
SOLUTION - ESTABLISH METHODS FOR WAFER SAWING, STACKING AND BONDING, AND FOR STACK SAWING, LAPPING, AND POLISHING IN ORDER TO OBTAIN A THREE DIMENSIONAL DIODE STRUCTURE. THEN FIT AND ATTACH POLISHED STACKS TO WAVEGUIDE WALL. ALSO SET UP A HIGH TEMP METAL SYST.						
(1142) TITLE - PROCESS VALIDATION FOR SEMICONDUCTOR DEVICES				300	400	
PROBLEM - THERE IS NO METHOD FOR VALIDATING SHORT RUNS OF SEMICONDUCTOR INTEGRATED CIRCUITS SHORT OF TESTING THEM THROUGH THEIR FULL RANGE OF TESTS. MORE CIRCUITS ARE NEEDED TO VALIDATE THE IC THAN TO FILL THE ORDER.						
SOLUTION - DEVELOP A PROCESS CONTROL MONITOR CIRCUIT FOR INCLUSION ON EVERY WAFER AND TEST IT TO VALIDATE THAT ALL PROCESSES ARE IN CONTROL. ALSO CERTIFY THE LINE AS TO PROCESS CONTROLS.						

CATEGORY
IPIP

MMT PROGRAM PLAN
RCS DRCMT 126

	PRIOR	FUNDING ($000) 83	84	85	86	87
COMPONENT -- MISCELLANEOUS						
(1121) TITLE - MISSILE MANUFACTURING PRODUCTIVITY IMPROVED PROGRAM	2525			5000	2000	
PROBLEM - THE HELLFIRE MISSILE WILL BE BUILT IN FACILITIES THAT ARE NOT MODERN, WITH PROCESSES THAT ARE NOT OPTIMUM AND WITH EQUIPMENT THAT IS NOT UPDATED. A STUDY OF METHODS, EQUIPMENT AND FACILITIES IS NEEDED WITH A VIEW TOWARD MODERNIZATION.						
SOLUTION - DEVELOP A PLANT MODERNIZATION PLAN IN WHICH GOVERNMENT AND THE COMPANIES SHARE IN THE UPDATING OF PROCESSES AND EQUIPMENT AND ALSO SHARE IN THE SAVINGS OBTAINED. CONDUCT PROGRAMS AT ROCKWELL, COLUMBUS AND MARTIN, ORLANDO.						

CATEGORY
MISSILE STRUCTURE

COMPONENT -- AIRFRAMES-COMPOSITES						
(1020) TITLE - MFG PROCESSES FOR FUSED SILICA FIBERS						700
PROBLEM - BECAUSE OF THE STRENGTH DEGRADATION OF GLASS REINFORCED STRUCTURAL COMPOSITES, PURE FUZED SILICA FIBERS ARE NEEDED FOR THESE APPLICATIONS. A COMMERCIAL SOURCE FOR PURE, CONTINUOUS, FIXED SILICA FIBERS DOES NOT EXIST.						
SOLUTION - A PILOT PRODUCTION FACILITY WILL BE ESTABLISHED FOR THIS PURPOSE. THE PROGRAM WILL SCALE-UP AND DRAW MULTIPLE FIBERS FROM THE ENDS OF FUZED SILICA RODS.						
(1080) TITLE - LOW COST CARBON/CARBON NOSETIPS					550	
PROBLEM - THE WEAVING PROCESS TO FABRICATE CARBON/CARBON NOSETIP PREFORMS IS LABOR INTENSIVE BECAUSE OF THE FINEWEAVE CENTER-TO-CENTER YARN SPACINGS. IN ADDITION, PREFORMS USE EXPENSIVE GRAPHITE YARN AND REQUIRE LONG IMPREGNATION CYCLES.						
SOLUTION - DEVELOP OPTIMAL FABRICATING PROCEDURES FROM LOWER COST MATERIALS, PITCH RESIN AND T-300 CARBON FIBERS. UTILIZATION OF SHORTER DENSIFICATION CYCLES PREFORMS, AND FIBER SPACINGS WILL PROVIDE THE MEANS FOR REDUCING CYCLE TIMES.						
(1082) TITLE - HIGH ANGLE TAPE WRAPPED HEATSHIELDS						900
PROBLEM - DATA HAS SHOWN THAT THE EROSION PERFORMANCE OF TAPE WRAPPED HEATSHIELDS IMPROVES AS THE SHINGLE ANGLE INCREASES ABOVE 30 DEGREES. CURRENT MFG TECHNIQUES DO NOT LEND THEMSELVES TO HIGH WRAP-ANGLE HEATSHIELDS.						
SOLUTION - DEVELOP IMPROVED WRAPPING TECHNIQUES TO CURRENT TAPE WRAPPING EQUIPMENT AND PROCESSING TECHNOLOGY.						

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- MACHINING							
(3302)	TITLE - ELECTRO DISCHARGE MACHINING PROCEDURE						400
	PROBLEM - THERE ARE MANY FABRICATION PROBLEMS DUE TO TIGHT TOLERANCE REQUIREMENTS IN FABRICATING MOUNTING HOLES FOR ARRAY ELEMENTS OF THE RADAR ANTENNAS.						
	SOLUTION - ESTABLISH TOOLING AND TECHNIQUES FOR FORMING HOLES IN FULL-SIZE ARRAY ELEMENT SUPPORT PLATES BY ELECTRO DISCHARGE MACHINING.						

CATEGORY

PROPULSION SYSTEM

COMPONENT -- MOTOR CASES							
(3343)	TITLE - FABRICATION OF INTEGRATED CASE AND GRAIN						750
	PROBLEM - CONSIDERABLE LABOR IS REQUIRED TO MANUFACTURE ASSEMBLE AND FINISH PROPULSION SYSTEMS.						
	SOLUTION - DEVELOP STRIP WOUND INTEGRATED CASE AND GRAIN PROCESS TO INTEGRATE MANUFACTURE ASSEMBLY AND FINISHING IN LOW COST AUTOMATIC PRODUCTION LINE.						
COMPONENT -- MOTOR COMPONENTS							
(1036)	TITLE - PRODUCTION METHODS FOR VSTT TURBINE ROTORS						400
	PROBLEM - TURBINE ROTORS ARE SUBJECT TO STRESS AND FATIGUE LEVELS AS ENGINE THRUST INCREASES.						
	SOLUTION - IMPLEMENT PILOT PRODUCTION PROGRAM TO ESTABLISH COST EFFECTIVE PRODUCTION AND TEST TECHNIQUES TO FABRICATE TURBINE ROTORS WITH INCREASED STRESS AND FATIGUE LEVELS.						
(1051)	TITLE - REPLACEMENT OF ASBESTOS IN ROCKET MOTOR INSULATIONS	475	280	250			
	PROBLEM - PRESENT ASBESTOS CONTAINING INSULATORS CAN NO LONGER BE MANUFACTURED AFTER 1981 DUE ITS BEING IDENTIFIED AS A CARCINOGEN. THUS THE GOVT HAS LOST THE CAPABILITY OF USING INSULATING MATERIALS THAT HAS PROVEN TO BE AN EXCELLENT THERMAL BARRIER.						
	SOLUTION - FILLER MATERIALS OTHER THAN ASBESTOS ARE AVAILABLE. FIBER GLASS AND SILICA HAVE BEEN USED IN SPECIALIZED APPLICATIONS AND WOLLASTONITE LOOKS PROMISING. MATERIALS SPECS AND MOTOR TEST VERIFICATION MUST BE DONE BEFORE A SUBSTITUTE MATERIAL CAN BE USED.						

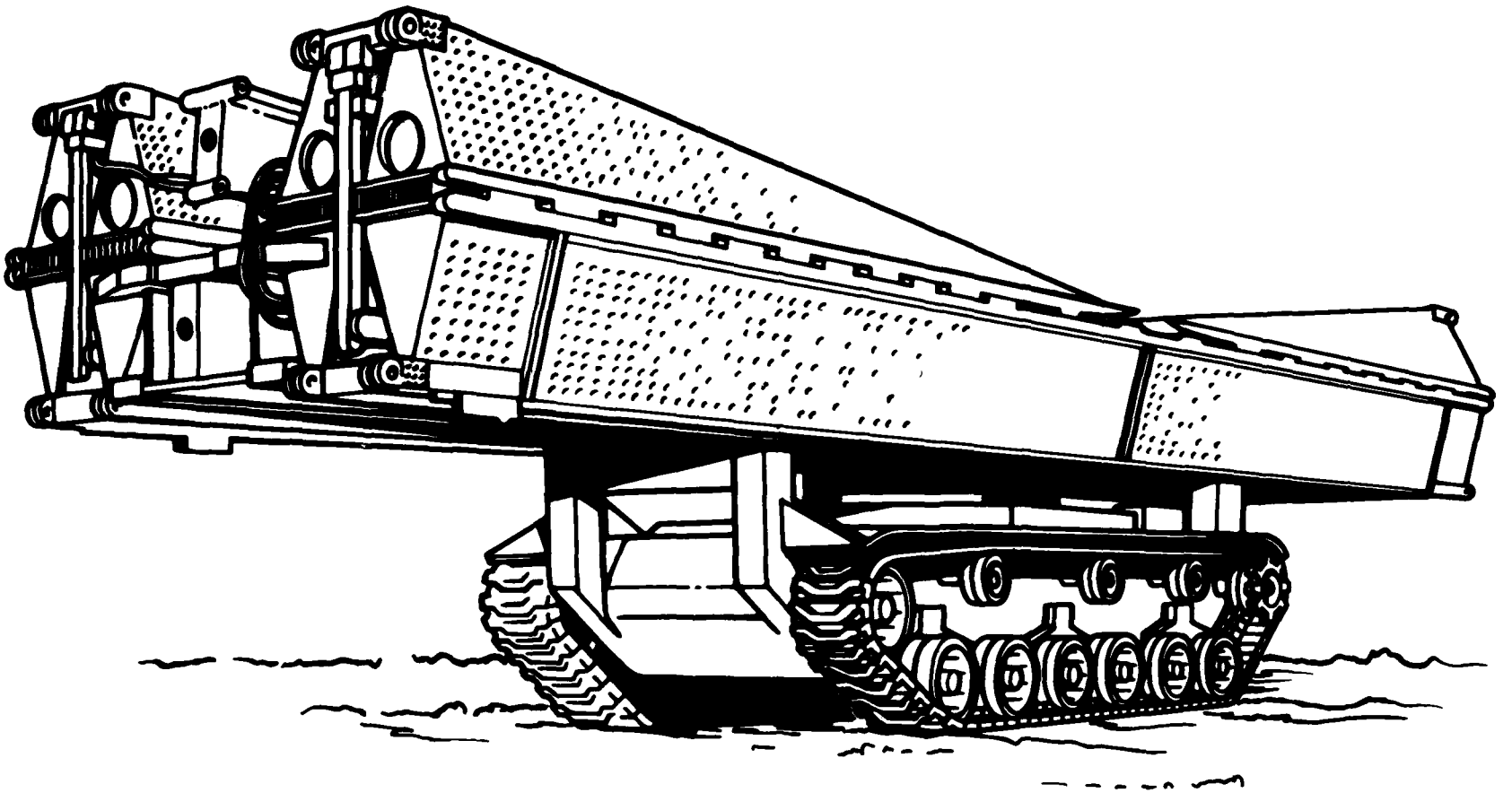
		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- MOTOR COMPONENTS (CONTINUED)							
(1086)	TITLE - COBALT REPLACEMENT IN MARAGING STEEL F/ROCKET MOTOR COMP	910	500				
	PROBLEM - CURRENT HIGH PERFORMANCE ROCKET MOTOR COMPONENTS UTILIZE MARAGING STEELS IN LARGE QUANTITIES. COBALT, ONE OF THE KEY INGREDIENTS COMES FROM POLITICALLY SENSITIVE AREAS AND IS BECOMING DIFFICULT TO OBTAIN.						
	SOLUTION - OPTIMIZE M&LL PROCEDURES AND EVALUATE IN A ROCKET MOTOR THE NEW COBALT FREE MARAGING STEEL ALLOYS.						
(1087)	TITLE - APPLICATION OF COMMERCIAL GRADE KEVLAR TO ROCKET MOTOR COMP				400		
	PROBLEM - CURRENT MILITARY ROCKET MOTOR COMPONENTS USE KEVLAR 49 FIBER IN LARGE QUANTITIES. THIS AEROSPACE GRADE IS VERY COSTLY.						
	SOLUTION - OPTIMIZE M&LL PROCEDURES AND MOTOR COMPONENT PROCESSING METHODOLOGY FOR COMMERCIAL GRADE KEVLAR AND EVALUATE T+E PERFORMANCE IN A ROCKET MOTOR COMPONENT ENVIROMENT						
(1089)	TITLE - INTEGRAL ROCKET MOTOR COMPOSITE POLE PIECES AND ATTACHMENTS		325	350	350		
	PROBLEM - CURRENT FILAMENT WOUND COMPOSITE ROCKET MOTOR CASES REQUIRE FORGED METAL POLE PIECES, NOZZLE CLOSURE ATTACHMENT RINGS, AND OTHER ATTACHMENT RINGS. THESE COMPONENTS ARE EXPENSIVE, AND REQUIRE LONG LEAD TIME PROCUREMENT.						
	SOLUTION - ESTABLISH A FILAMENT WINDING PRODUCTION PROCESS FOR FABRICATING COMPOSITE MOTOR CASES WITH INTEGRAL POLE PIECES, AFT ATTACHMENT RINGS, AND FORWARD AND AFT DOME SECTIONS.						
(1126)	TITLE - WOUND ELASTOMER INSULATOR PROCESS	650	325	450			
	PROBLEM - LARGE TACTICAL ROCKET MOTOR INSULATORS ARE COSTLY, LACK DESIGN CHANGE FLEXIBILITY AND SUFFER LONG LEAD TIMES. CURRENT PROCESSES INVOLVE BONDING TOGETHER FINISHED SECTIONS OR LAY-UP OF GREEN STOCK FOLLOWED BY STITCHING, CURING AND FINISHING TO SIZE.						
	SOLUTION - THE NEW PROCESS EXTRUDES AND WINDS A STRIP OF GREEN RUBBER OF PRECISELY CONTROLLED THICKNESS DIRECTLY ONTO THE CASE MANDREL. MICROPROCESSOR CONTROL ALLOWS EXPEDIENT DESIGN CHANGES.						
(1136)	TITLE - FIELD/DEPOT REPAIR OF COMPOSITE MOTOR COMPONENTS					500	500
	PROBLEM - COMPOSITE MOTOR COMPONENTS PRESENTLY HAVE LONG LEAD TIMES AND HIGH COST WHEN SENT TO BE REPAIRED.						
	SOLUTION - REPAIRABLE COMPONENTS WOULD BE SHIPPED TO A DEPOT OR REPAIRED IN THE FIELD TO LESSEN DOWNTIME AND REDUCE COSTS. THIS PROJECT WOULD ESTABLISH THE PROCESSES NEEDED FOR THIS CONCEPT.						

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- NOZZLES							
(1138)	TITLE - MOLDED PLASTIC NOZZLE FOR 2.75 INCH ROCKET				580	400	175
	PROBLEM - TO CONSERVE WEIGHT AND REDUCE COSTS, A CHANGE FROM STEEL TO PLASTIC IS ATTRACTIVE. UNFORTUNATELY, INJECTION MOLDED NOZZLES FABRICATED TO DATE EXHIBIT INCONSISTENT DIMENSIONAL TOLERANCES AND INTERNAL DEFECTS. MANY REQUIRE HAND REWORK.						
	SOLUTION - REDESIGN THE INJECTION MOLDING ROCKET NOZZLE DIE TO PROVIDE VALIDATION OF THE PROCESS TO HOLD REQUIRED DIMENSIONAL TOLERANCES AND ELIMINATE INTERNAL DEFECTS.						
COMPONENT -- PROPELLANTS							
(1038)	TITLE - PROD OF NITRO POLYMERS FOR SMOKELESS PROPELLANTS						650
	PROBLEM - NITROCELLULOSE PLASTICIZER BINDER HAS A VERY LIMITED FLEXIBILITY FOR FORMULATION OF SMOKELESS PROPELLANT COMPOSITIONS.						
	SOLUTION - MAKE PRODUCTION OF POLYETHYLENE GLYCOL NITRAMINE POLYMER COMMERCIALLY AVAILABLE.						
(1044)	TITLE - CONTINUOUS PROCESS FOR PROPELLANT MANUFACTURE						1477
	PROBLEM - PROPELLANT MANUFACTURE IS GENERALLY A BATCH PROCESS WITH INHERENT PROBLEMS. CURE ACCELERATORS MUST BE AVOIDED SINCE THEY SHORTEN POT LIFE. THE PROCESS HAS HIGH LABOR REQUIREMENTS. HIGH VISCOSITIES RESULT IN DISCARDING THE BATCH.						
	SOLUTION - A CONTINUOUS MIXING AND MOTOR LOADING PROCESS WILL REDUCE PRODUCTION LABOR AND FACILITIES, AND IMPROVE PROPELLANT QUALITY AND RELIABILITY. SAFETY PROBLEMS RELATED TO QUANTITY DISTANCES CAN BE MINIMIZED.						
(3317)	TITLE - CASTING OF PROPELLANTS						350
	PROBLEM - THE END BURNING SUSTAINER GRAIN FOR STINGER IS PRESENTLY CAST AND CURED, MACHINED, INHIBITED WITH BOOT WHICH IS BONDED TO EXTERIOR OF GRAIN.						
	SOLUTION - DEVELOP CAST-IN-BOOT PROCESS TO CAST GRAIN DIRECTLY INTO INHIBITOR BOOT.						
(344	TITLE - OPTIONAL PROPELLANT INGREDIENTS	250	150	175			
	PROBLEM - A NUMBER OF CHEMICAL INGREDIENTS USED IN SOLID ROCKET PROPELLANTS HAVE BECOME UNAVAILABLE BECAUSE SOME OF THE REAGENTS ARE HAZARDOUS.						
	SOLUTION - STUDIES SHOW THAT ISOPHRONONE DIISOCYANATE (IPDI) CAN BE MADE IN A BATCH PROCESS WITHOUT USING PHOSGENE. THIS LABORATORY PROCESS WILL BE SCALED UP.						

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- PROPELLANTS (CONTINUED)							
(3450)	TITLE - SCALE UP + DEMONSTRATION OF A PROCESS FOR DIBORANE						950
	PROBLEM - THE PRESENT PROCESS IS A BATCH OPERATION AND BECAUSE OF THE DIFFICULTY IN CONTROLLING THE CHEMISTRY THE BATCHES ARE SMALL RESULTING IN HIGH LABOR COSTS.						
	SOLUTION - IT IS ESTIMATED THAT DIBORANE CAN BE PRODUCED USING INEXPENSIVE RAW MATERIALS- BORIC ACID, METHANOL AND SODIUM HYDRIDE IN A SIMPLE CONTINUOUS PROCESS THAT IS EASILY CONTROLLED. A PILOT FACILITY WILL BE BUILT TO DEVELOP THE PROCESSES.						

CATEGORY
TEST EQUIPMENT

COMPONENT -- ELECTRONIC COMPONENTS							
(1060)	TITLE - ELECTRICAL TEST AND SCREENING OF CHIPS	750	470	925			
	PROBLEM - ONE UNRELIABLE CHIP IN MILITARY ELECTRONIC ASSEMBLIES CAUSES REJECTION OR DESTRUCTION OF THE ENTIRE PACKAGE. PRESENT MEANS FOR DETERMINING CHIP RELIABILITY OR INTEGRITY IS A PROBE TESTING TECHNIQUE WHICH IS TIME CONSUMING AND DESTRUCTIVE.						
	SOLUTION - PLACE A MONOLITHIC CHIP TESTING DEVICE AT THE POINT JUST BEFORE THE CHIP IS BONDED TO THE SUBSTRATE. INCLUDE ON THE PROBE A NON-DESTRUCTIVE POINT AND A METHOD FOR OXIDE REMOVAL.						
(3115)	TITLE - ENGINEERING FOR CALIBRATION EQUIPMENT	4898	240	1000	900	1000	
	PROBLEM - MEASUREMENT SCIENCES OR METROLOGY MUST BE CONTINUALLY ADVANCED IN RELEVANT TECHNOLOGY AREAS TO KEEP PACE WITH MANY ARMY PROGRAMS.						
	SOLUTION - ADVANCEMENTS MUST BE MADE BY DERIVING NEW TYPES OF STANDARDS.						
(3243)	TITLE - ANALOG FAULT ISOLATION OF PRINTED CIRCUIT BOARDS						500
	PROBLEM - MANUAL FAULT ISOLATION AND TROUBLE SHOOTING METHODS ARE SLOW.						
	SOLUTION - ESTABLISH AUTOMATIC FAULT ISOLATION AND TROUBLE SHOOTING METHODS FOR ANALOG CIRCUIT ASSEMBLIES.						



MOBILITY EQUIPMENT RESEARCH AND DEVELOPMENT COMMAND (MERADCOM)

US ARMY MOBILITY EQUIPMENT RESEARCH AND DEVELOPMENT COMMAND

(MERADCOM)

MERADCOM, located at Fort Belvoir, VA, conducts a widely diversified program to improve the Army's combat readiness with a superior combat and deterrent force in the major program areas of mobility/countermobility, survivability, energy, and logistics."

Procurements for items under MERADCOM's cognizance are placed with the private sector, and much of MERADCOM's MMT effort is accomplished by the private sector.

To address the problem of increased system acquisition costs, MERADCOM has identified major problem areas where improved manufacturing technology is needed. Major problem areas confronting MERADCOM include:

a. Fuels Dispensing Equipment. Nitrite rubber, the material presently used in fuel hoses, will crack if flexed at temperatures below -25° F. Fueling operations deteriorate severely at low temperatures and the hose is not compatible with a wide range of fluids. Recognizing these limitations, MERADCOM is developing Arctic Fuels Dispensing Equipment that will operate reliably at -60° F. This effort is concerned with establishing a manufacturing technology to use elastomers such as polyurethane, polyethylene, polyvinyl chloride, and thermoplastic rubbers. Manufacturing processes include dipping, spraying, and casting the elastomeric materials to form the hose tube and cover.

b. Providing Military Bridges at Moderate Cost, Which Have High Mobility and High Emplacement Speeds While Retaining The Ability to Withstand the Abusive Treatment Inherent in the Battlefield Environment. High strength, low density composite materials offer great promise for solutions to this problem. Increased production of high strength fiber materials has reduced materials cost. Techniques for the fabrication and installation of these materials into usable bridge components is the area in which large cost reductions are possible. The reduction of presently used labor intensive methods, through the application of automated processes, will reduce component costs. Initial design in these materials offer improved performance due to the flexibility possible in material configuration.

c. Combat Vehicle Deperming. Armored vehicles have a magnetic signature which is induced by various manufacturing operations. This signature makes them vulnerable to magnetic influence land mines. Several nations, including the USA, have mines fuzed in this manner. By exploiting and implementing the knowledge gained by our NATO Allies and the US Navy, a production facility for removing the magnetic signature will be designed and fabricated.

MERADCOM

COMMAND FUNDING SUMMARY
(THOUSANDS)

CATEGORY	FY83	FY84	FY85	FY86	FY87
BRIDGING	0	0	1540	1350	900
FIELD FORTIFICATIONS	0	131	342	0	0
LAND MINES	0	1358	1284	0	0
POWER SOURCES	0	0	0	550	900
TOTAL	0	1489	3166	1900	1800

CATEGORY		FUNDING ($000)				
	PRIOR	83	84	85	86	87
BRIDGING						
COMPONENT -- GENERAL						
(3803) TITLE - ACCESS/EGRESS MAT PANELS				580	250	
PROBLEM - TO PRODUCE AN INEXPENSIVE, LIGHTWEIGHT, METAL PANEL WITH REQUIRED STRENGTH AND SHAPE CHARACTERISTICS USING AN EFFICIENT PRODUCTION METHOD. THE PROVEN PANEL DESIGN FOR ACCESS/EGRESS AT RIVER CROSSINGS IS HAND FABRICATED.						
SOLUTION - A ROLL FORMING PROCESS COMBINED WITH OPTIMUM SHEET SIZING PRIOR TO BENDING ARE REQUIRED TO PRODUCE THE REINFORCED, CORRUGATED SHAPE. THIS WILL ELIMINATE THE TIME CONSUMING BREAK PRESS AND HAND WELDING OPERATIONS.						
COMPONENT -- STRUCTURAL MEMBERS						
(3802) TITLE - HIGH STABILITY TRUSS CHORD						500
PROBLEM - PRODUCE A HIGH STIFFNESS, HIGH STRENGTH, LIGHTWEIGHT, LOW COST, TUBULAR TRUSS ELEMENT WHOSE DESIGN IS CONTROLLED BY ITS SLENDER CONFIGURATION AND PHYSICAL PROPERTIES TO MAINTAIN LOCAL AND GLOBAL STABILITY.						
SOLUTION - USE THE CONTINUOUS WEAVING OF EPOXY WETTED HIGH MODULUS GRAPHITE FIBER TO FORM MULTIPLE STACKED LAYERS WHICH CAN BE PROPORTIONED AND CONFINED TO PROVIDE THE REQD GEOMETRY.						
(3804) TITLE - COMPOSITE BOTTOM CHORD FOR MILITARY BRIDGES				960	1100	400
PROBLEM - AT PRESENT, APPROPRIATE MFG FACILITIES FOR COMPOSITE BOTTOM CHORDS DO NOT EXIST.						
SOLUTION - INVESTIGATE, EVALUATE + IDENTIFY AVAILABLE METHODS AND MACHINERY WHICH CAN BE MODIFIED FOR THE HIGH RATE PRODUCTION OF THE CHORDS. SET UP A SMALL SCALE PILOT ASSY LINE TO DEMONSTRATE THE MFG METHODS.						
FIELD FORTIFICATIONS						
COMPONENT -- HOSES						
(3800) TITLE - NON-GUM ELASTOMER HOSES			131	342		
PROBLEM - HOSE MANUFACTURING HAS CHANGED VERY LITTLE IN 50 YRS. THEY USE GUM RUBBERS, ARE HAND-BUILT AND RESIST AUTOMATION. BESIDES BEING EXPENSIVE PERFORMANCE IS LIMITED IN (1) LOW TEMPERATURE AND (2) COMPATIBILITY WITH A WIDE RANGE OF FLUIDS.						
SOLUTION - NEW MATERIALS OFFER IMPROVED PERFORMANCE BUT REQUIRE NEW FABRICATION TECHNIQUES. NEW MANUFACTURING METHODS SHOWN TO BE FEASIBLE UNDER PRIOR R+D. THIS PROJECT PROPOSES TO USE THE NEW MATERIALS, SCALE-UP, OPTIMIZE NEW TECHNIQUES WITH AUTOMATION.						

CATEGORY
LAND MINES

FUNDING ($000)

	PRIOR	83	84	85	86	87
COMPONENT -- NEUTRALIZERS						
(3796) TITLE - COMBAT VEHICLE DEPERMING PRODUCTION FACILITY	916		1358	1284		

PROBLEM - PRESENT DESIGN AND FABRICATION TECHNIQUES FOR VEHICLES RESULT IN A SIGNIFICANT MAGNETIC SIGNATURE. THIS MAGNETIC SIGNATURE CAN BE USED TO FUZE LAND MINES TO ATTACK THE VEHICLE UNDERCARRIAGE.

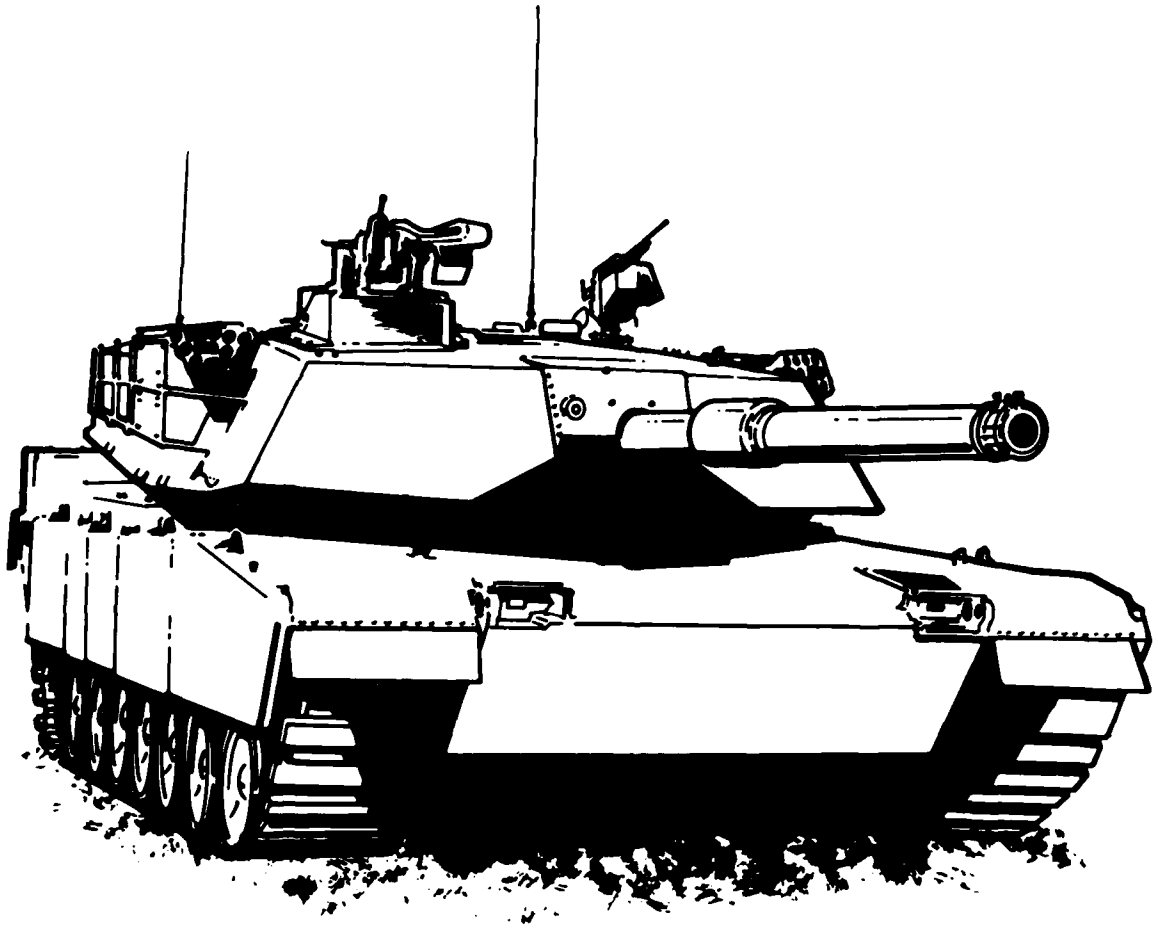
SOLUTION - CONSTRUCT A PILOT DEPERMING PRODUCTION FACILITY THAT WILL ALLOW DEVELOPMENT OF A DEPERMING TECHNIQUE FOR US ARMORED VEHICLES.

CATEGORY
POWER SOURCES

COMPONENT -- GENERATOR/ALTERNATOR						
(3801) TITLE - FREE PISTON STIRLING ENGINE GENERATOR SET					550	900

PROBLEM - MANUFACTURING COSTS FOR COMPONENTS OF THE FREE PISTON STIRLING ENGINE GENERATOR SET WILL BE HIGH. GAS LUBRICATED BEARINGS, LINEAR MOTORS, MULTIFUEL COMBUSTORS AND OTHER COMPONENTS HAVE NEVER BEEN MADE IN PRODUCTION QUANTITIES.

SOLUTION - IDENTIFY OR ESTABLISH ADVANCED MANUFACTURING TECHNIQUES FOR THESE COMPONENTS AND PERFORM COST/TECHNOLOGY TRADEOFFS FOR MANUFACTURING OPERATIONS



TANK-AUTOMOTIVE COMMAND
(TACOM)

US ARMY TANK-AUTOMOTIVE COMMAND

(TACOM)

The US Army Tank and Automotive Command is located in Warren, MI, and has the mission of developing, acquiring, and fielding tracked and wheeled military combat, tactical, and general purpose vehicles. The mission is worldwide in scope and includes among its customers all of the US military services, and friendly foreign nations. The production base for mission items is made up of both private and government-owned contractor-operated facilities. MMT efforts are accomplished partially in-house and partially out-of-house. The TACOM MMT program is separated into six categories: armor, general, drive system, track, suspension, and vehicle body.

The main requirements in the field of armor are to increase the ballistic tolerance of conventional armor while reducing its overall weight, and develop new lightweight armor for the high speed, high survivability vehicles which are currently being evaluated in field tests. To meet these requirements, the Command is emphasizing Electro-Slag Remelt (ESR) steel armor and combination type armor to reduce the overall ballistic threat. To pursue these new armor developments, it will be necessary to have commerically available joining processes so that these new armors can be used cost effectively in production. TACOM has established several MMT projects covering joining ESR steel armor, welding complex alloys and shapes by laser, identifying electron beam welding applications, and optimizing both welding procedures and ultrasonic inspection of welds.

The major requirements for propulsion and track are to develop production techniques to manufacture propulsion and drive systems for the M1 and future tracked and non-tracked combat and tactical vehicles. Fabrication and joining are of major concern. TACOM is actively pursuing production development of compliant joints to join metals and non-metals and automated laser machining of complex machine alloys. Life cycle costs for various tactical and combat vehicles can be significantly decreased by eliminating premature failure or extending service life of components by reducing corrosion and deterioration. To support this area, TACOM is endeavoring to bring on line ceramic reinforced combustors.

The track and suspension category is constantly caught in the technical dilemma of producing more advanced systems to meet the ever increasing demands of higher performance in more adverse terrains while maintaining the overall reliability and maintainability of the system at or near current system costs. To achieve these objectives, the track area, as with the other categories, has been sub-divided into major thrust areas for better visibility and management control. These areas

are roadwheels, springs, torsion bar and tube, wheels, rubber pads, and shoes. In these areas the general thrusts have been to introduce production techniques for metal matrix composites, non-metallic matrix composites, advanced rubber compounds, advance elastomeric compounds, lightweight castings, hard surface coatings and powder metallurgy.

In body/frame, the main thrusts are the conservation of fuel and material. To meet these requirements the objective is to reduce the overall weight of the vehicle, to increase its payload, and lower the life cycle cost of the systems by reducing the corrosion and degradation of the materials of construction. Here the main areas of concern are coatings, lightweight/composite structures, miscellaneous components, structural members, and fuel tanks. Within these areas, work will be accomplished in plastic cab tops, maintenance free batteries with high impact resistance, and non-corrosive, lightweight non-structural tactical vehicle components.

TACOM

COMMAND FUNDING SUMMARY
(THOUSANDS)

CATEGORY	FY83	FY84	FY85	FY86	FY87
ARMOR	2585	3958	5531	11415	13205
BODY/FRAME	125	1155	2670	1125	1175
DRIVE SYSTEM	970	750	2470	2870	2795
GENERAL	800	0	0	2100	4350
IPIP	176	6600	10145	4450	1200
SUSPENSION SYSTEM	0	0	225	800	2450
TESTING	0	0	0	0	1150
TRACK	1250	0	625	1400	1100
TOTAL	5906	12463	21666	24160	27425

CATEGORY	FUNDING ($000)					
ARMOR	PRIOR	83	84	85	86	87
COMPONENT -- GENERAL						
(4577) TITLE - ATTACHMENT OF COMBINATION ARMOR TO COMBAT VEHICLES				1250	2000	1500
PROBLEM - COMBINATION ARMOR SYSTEMS PROVIDE LARGE BALLISTIC IMPROVEMENT BUT REQUIRE COMPLEX ATTACHMENT METHODS.						
SOLUTION - IDENTIFY COST EFFECTIVE METHODS FOR PRODUCTION APPLICATION.						
(5088) TITLE - HIGH-POWER ELECTRON BEAM WELDING IN AIR	45				350	350
PROBLEM - USE OF ELECTRON BEAM HAS NOT BEEN EXPLOITED.						
SOLUTION - ESTABLISH PROCEDURES UTILIZING THIS NEW PROCESS FOR RAPID ECONOMICAL JOINING OF ARMOR MATERIALS.						
(5094) TITLE - ALLOY AND ARMOR STEELS TREATED WITH RARE EARTH ADDITIVES	48			600		
PROBLEM - ARMOR STEELS UTILIZED CONVENTIONAL DEOXIDIZING AND SCAVENGING PROCESSES IN STEEL MAKING.						
SOLUTION - ESTABLISH TECHNIQUES TO TREAT STEELS WITH RARE EARTH ADDITIONS.						
(6038) TITLE - HIGH DEPOSITION WELDING PROCESSES FOR ARMOR	1503			500	115	
PROBLEM - WELDING IS LABOR INTENSIVE AND HIGH COST IT IS A MAJOR COST DRIVER IN ARMOR VEHICLE MANUFACTURE.						
SOLUTION - HIGH DEPOSITION WELDING PROCESSES WILL PERMIT WELDING TO BE ACCOMPLISHED MORE RAPIDLY THUS REDUCING MANPOWER REQUIREMENTS AND INCREASING PRODUCTIVITY.						
(6057) TITLE - M-1 COMBAT VEHICLE-MFG TECHNOLOGY	1357	1085	3057	1750	950	375
PROBLEM - MATERIALS AND MANUFACTURING PROCESSES EMPLOYED IN THE MFG OF THE M1 CAN BE IMPROVED BY INCORPORATING NEW TECHNOLOGIES TO THE CURRENT SYSTEM. THIS WILL ENABLE THE M1 TO BE PRODUCED MORE ECONOMICALLY.						
SOLUTION - IMPROVE PROCESSES FOR M1 MFG. THESE INCLUDE THERMAL CUTTING, AUTOMATED METALLIZING, THERMALLY ASSISTED MACHINING, ETC.						
(6059) TITLE - FVS COMBAT VEHICLE-MFG TECHNOLOGY	3356	1500	901	931	1500	3000
PROBLEM - MATERIALS AND MANUFACTURING PROCESSES EMPLOYED IN THE MFG OF THE FVS CAN BE IMPROVED BY INCORPORATING NEW TECHNOLOGIES TO THE CURRENT SYSTEM. THIS WILL ENABLE THE FVS TO BE MANUFACTURED MORE ECONOMICALLY.						
SOLUTION - IMPROVE PROCESSES FOR FVS MFG. THESE INCLUDE CAST ALUM COMPONENTS, LASER HEAT TREAT, SELF THREADING FASTNERS, ADHESIVE BONDING, PLASMA ARC WELDING, ETC.						

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- GENERAL (CONTINUED)							
(6125)	TITLE - WELD PROCESS PLANNING AND CONTROL				500	550	
	PROBLEM - PLANNING, MONITORING, AND INSPECTION OF THE WELDING PROCESS ARE EXPENSIVE, TIME CONSUMING, AND CAUSE PRODUCTION DELAYS WHEN A QUALITY PROBLEM IS SUSPECTED.						
	SOLUTION - USE THE COMPUTER FOR PROCESS PLANNING AND THE REDESIGN OF WELDED JOINTS, USE MONITORING SYSTEMS TO DETECT WELD CONDITIONS, AND AUTOMATE VISUAL INSPECTION OF WELDMENTS.						
(6403)	TITLE - ADVANCED CERAMIC/COMPOSITE ARMOR					1150	1300
	PROBLEM - THERE ARE NO COMMERCIAL SOURCES FOR NEWLY DEVELOPED CERAMIC ARMOR MATERIALS IN THE QUALITY, SIZES AND SHAPES NOR THE METHODS REQUIRED TO COMPLETE THE INSERTION OF THE ARMOR INTO THE END ITEM.						
	SOLUTION - ESTABLISH MANUFACTURING PROCESSES.						
COMPONENT -- HULL/BODY							
(5091)	TITLE - HEAVY ALUMINUM PLATE FABRICATION	30				300	280
	PROBLEM - MANY COMBAT AND TACTICAL VEHICLE HULLS AND THEIR COMPONENTS ARE FABRICATED FROM HEAVY ALUMINUM PLATE. CUTTING THIS HEAVY ALUMINUM PLATE TO SPECIFIED CONTOURS AND WELDING THE PIECES TOGETHER REQUIRES A GREAT DEAL OF MANUAL LABOR.						
	SOLUTION - ESTABLISH THE CAPABILITY TO CUT HEAVY ALUMINUM PLATE RAPIDLY USING PLASMA ARC WITH NUMERICAL CONTROLS. PROCESS PARAMETERS WILL BE ESTABLISHED FOR HIGH DEPOSITION WELDING PROCESSES.						
(6053)	TITLE - WELDING SYSTEMS INTEGRATION	53				500	1000
	PROBLEM - OF ALL METAL WORKING PROCESSES EMPLOYED IN TRACKED COMBAT VEHICLES MANUFACTURING, WELDING IS THE MOST LABOR INTENSIVE AND AFTER MACHINING, THE MOST COSTLY. AUTOMATION WHICH COULD REDUCE THESE COSTS IS AS YET AN UNACHIEVED GOAL.						
	SOLUTION - UNDERTAKE A COORDINATED PROGRAM TO INTEGRATE EXISTING EXPERTISE AND TECHNOLOGY TO ADDRESS ONE APPLICATION (M1 HULL). EXPERTISE WILL BE IN AREAS OF WELDING PROCESS CONTROL, SENSORY TECHNOLOGY, STRESS ANALYSIS, AND COMPUTER CONTROL.						
(6085)	TITLE - IMPROVED CASTING PROCESSES						600
	PROBLEM - THE CASTING PROCESS IS WASTEFUL.						
	SOLUTION - IMPROVE CAST ARMOR QUALITY THROUGH ADVANCED SOLIDIFICATION TECHNIQUES, SPECIAL DEOXIDATION PRACTICES, AND UNIQUE MOLDING PROCESSES.						

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- HULL/BODY (CONTINUED)							
(6099)	TITLE - MANUFACTURING METHODS FOR SPECIALIZED ARMOR MATERIALS					4000	4800
	PROBLEM - INDUSTRY PRODUCTION PRACTICES F/PROVIDING COMPLEX COMPONENTS COMPOSED OF NOVEL PROTECTIVE ARMOR MATERIALS IS UNAVAILABLE OR SUFFERS FROM MARKED DEFICIENCIES.						
	SOLUTION - SPECIAL ADAPTATIONS OF COMMERCIAL PRACTICES WILL BE USED TO ACCOMPLISH THE DEFORMATION CYCLES AND FABRICATION PROCEDURES REQUIRED TO PRODUCE THESE ADVANCED MATERIALS IN THE DIMENSIONS AND SHAPES NEEDED.						

CATEGORY
BODY/FRAME

COMPONENT -- FUEL TANKS							
(5064)	TITLE - LIGHTWEIGHT SADDLE TANK	313	125				
	PROBLEM - FABRICATE AN ECONMICAL HIGH IMPACT NON-METALLIC FUEL TANK.						
	SOLUTION - ESTABLISH PROCEDURES AND METHODS TO PRODUCE A LEAK-PROOF FUEL TANK.						
COMPONENT -- LIGHTWEIGHT/COMPOSITE STRUCTURES							
(4001)	TITLE - MANUFACTURING FOR CORROSION PREVENTION IN TACTICAL VEHICLES			595	2070	725	500
	PROBLEM - CURRENTLY THE ARMY HAS SEVERE CORROSION PROBLEMS WITH ITS TACTICAL TRUCK FLEET. ACHIEVING CORROSION RESISTANCE THROUGH THE APPLICATION OF RUSTPROOFING COMPOUNDS CONTRADICTS THE NBC REQUIREMENT FOR VEHICLES WITH CHEMICAL AGENT RESISTANT COATINGS.						
	SOLUTION - REINFORCED COMPOSITE MATERIALS CAN REDUCE CORROSION AND WEIGHT AND SIMPLIFY MFG. TECHNOLOGY REQUIREMENTS AND PRODUCTION PARAMETERS FOR VARIOUS COMPONENTS, FROM SMALL PARTS TO COMPLETE TRUCK CABS, WILL BE DETERMINED.						
(5042)	TITLE - MANUFACTURING TECHNIQUES FOR NON-METALLIC TOTAL VEHICLES				250	250	250
	PROBLEM - CURRENT VEHICLE COMPONENTS ARE MADE FROM METALS AND ARE EXCESSIVE IN WEIGHT AND TEND TO CORRODE. NEW NON-METALLIC MATERIALS ARE AVAILABLE AND COULD BE ADAPTED.						
	SOLUTION - VALIDATE FEASIBILITY OF MOLDING VEHICLE COMPONENTS FROM NON-METALLIC MATERIAL USING A MINIMUM OF PARTS AND ESTABLISH PRODUCTION TECHNIQUES.						
(6000)	TITLE - LIGHTWEIGHT TILT-UP HOOD/FENDER ASSEMBLY	236		510	200		
	PROBLEM - CURRENT HOOD/FENDER ASSEMBLY MADE FROM STEEL STAMPINGS ARE TOO HEAVY FOR ONE MAN TO LIFT.						
	SOLUTION - REDUCE WEIGHT BY MANUFACTURING ITEMS FROM LIGHTWEIGHT FORMABLE PLASTIC.						

	FUNDING ($000)					
	PRIOR	83	84	85	86	87
COMPONENT -- MISC COMPONENTS						
(6077) TITLE - SEALED LEAD ACID STORAGE BATTERY			50	150	150	125
PROBLEM - MILITARY STORAGE BATTERIES LAST ONLY ABOUT 24 MONTHS. THEY REQUIRE PERIODIC MAINTENANCE AND SERVICE. ALSO, THEY ARE SUBJECT TO LEAKAGE, SPILLAGE AND SUBSEQUENT CORROSION OF TERMINALS AND BATTERY COMPONENTS.						
SOLUTION - DEVELOP A PERMANENTLY SEALED BATTERY WHICH WILL COMPLETELY ELIMINATE LEAKAGE AND CORROSION. USE HYBRID PLATE ALLOYS IN THEM TO INCREASE BATTERY LIFE, PERFORMANCE AND CAPACITY.						
COMPONENT -- STRUCTURAL MEMBERS						
(4579) TITLE - INDUSTRIAL PRACTICES FOR WELDING CONSTRUCTIONAL ALLOY STEELS						300
PROBLEM - A WIDE VARIETY OF HIGH STRENGTH CONSTRUCTIONAL ALLOYS STILL WILL BE USED IN GREATER QUANTITIES TO MEET WEIGHT REQUIREMENTS.						
SOLUTION - DOCUMENT RECOMMENDED WELDING PRACTICES AND PROCEDURES TO IDENTIFY SIGNIFICANT FACTORS AFFECTING PRODUCTION QUALITY FOR THE VARIOUS MATERIALS AND EQUIPMENT.						

CATEGORY: DRIVE SYSTEM

COMPONENT -- ENGINE						
(5053) TITLE - MANUFACTURE OF ENGINE COMPONENTS OF CERAMIC	500	670	750	750		
PROBLEM - FABRICATION OF HIGH EFFICIENCY, HIGH TEMPERATURE DIESEL ENGINES REQUIRES ADVANCED MATERIALS. ENGINES FABRICATED WITH CERAMIC COMPONENTS HAVE BEEN DEMONSTRATED IN R+D BUT MANUFACTURING METHODS FOR SERIAL PRODUCTION COMPONENTS ARE LACKING.						
SOLUTION - RECENT RESEARCH EFFORTS INDICATE THAT ENGINE COMPONENTS FROM HIGH STRENGTH STRUCTURAL CERAMICS (SILICON NITRIDE, SILICON CARBIDE) ARE FEASIBLE. THIS EFFORT WILL ESTABLISH QUANTITY PRODUCTION OF CERAMIC COMPONENTS OF CONSISTENT QUALITY.						
(6008) TITLE - AUTOMATED COMPUTER CONTROL LASER MACHINING					350	550
PROBLEM - CONVENTIONAL MACHINING OF DIFFICULT TO MACHINE MATERIALS IS VERY EXPENSIVE. RAPID TOOL WEAR AND LOCALIZED HEATING OF THE WORKPIECE IMPACT REMOVAL RATES AND METALLURGICAL CHARACTERISTICS.						
SOLUTION - THIS PROGRAM WILL DEVELOP TECHNIQUES FOR LASER MACHINING BY NUMERICAL CONTROL.						

	FUNDING ($000)					
	PRIOR	83	84	85	86	87
COMPONENT -- ENGINE (CONTINUED)						
(6018) TITLE - JOINING OF ATTACHMENTS TO CERAMICS						450
PROBLEM - CURRENT METHOD OF JOINING METALS TO CERAMIC JOINTS ARE NOT RELIABLE AND HAVE POOR LIFE.						
SOLUTION - INVESTIGATE USE OF JOINTS THAT ARE COMPLIANT OR USE INTERMEDIATE CONNECTING PHASE.						
(6019) TITLE - GRAIN BOUNDARY IMPROVEMENT PROCESSING FOR CERAMICS					220	420
PROBLEM - EFFECT OF HIGH TEMPERATURE ON CERAMICS GRAIN BOUNDARIES LIMIT THEIR APPLICATION.						
SOLUTION - UPSCALE DEVELOPED TECHNIQUES FOR DEVELOPING A NONGLASS BOUNDARY OR ELIMINATE THE GRAIN BOUNDARY PHASE.						
(6028) TITLE - PRODUCTION QUALITY CONTROL BY AUTO INSPECTION EQUIPMENT(CAM)	60				250	250
PROBLEM - THE INCREASED COMPLEXITY OF COMBAT VEHICLES HAS RESULTED IN EXCESSIVE TIME AND HIGH SKILL LEVEL REQUIREMENTS FOR INSPECTION AND TEST.						
SOLUTION - DEVELOP AUTOMATED DIAGNOSTIC EQUIPMENT TO REDUCE TIME AND LOWER SKILL REQUIREMENTS. AUTOTESTING OF WIRING HARNESSES AND ENGINES WILL BE ACCOMPLISHED. AUTOMATION OF INSPECTION RECORDS WILL BE ACCOMPLISHED.						
(6079) TITLE - AGT-1500 ENGINE	1360			1120	1800	1125
PROBLEM - THE NEED TO REDUCE COST AND IMPROVE PERFORMANCE OF THE AGT-1500 TURBINE ENGINE REQUIRES NEWER AND MORE INNOVATIVE MANUFACTURING TECHNOLOGY.						
SOLUTION - INCORPORATE NEW PROCESSES AND TECHNOLOGY INTO THE AGT-1500 MANUFACTURING METHODS.						
(6123) TITLE - CERAMIC TURBOCHARGER ROTOR				250	250	
PROBLEM - SMALL SILICON CARBIDE TURBOCHARGER ROTORS HAVE BEEN FABRICATED WITH A PROPRIETARY PROCESS IN INDUSTRY AND WERE SUCCESSFUL; HOWEVER, THE PROCESS CAN NOT BE APPLIED DIRECTLY TO ARMY COMPONENTS BECAUSE OF THE PROPIETARY LIMITATION AND SCALE PROBLEMS.						
SOLUTION - DEVELOP A PROCESS AND SCALE IT TO ACCOMMADATE THE LARGER SIZED ARMY ROTORS.						
COMPONENT -- TRANSMISSION						
(5005) TITLE - COLD FORGED GEARS TO DRAWING TOLERANCES	307	300				
PROBLEM - MACHINING AND OTHER PROCESSES ADD COST TO THE FINISHED COMPONENT.						
SOLUTION - ESTABLISH A MFG PROCESS TO RESULT IN A FINISHED GEAR TO DRAWING TOLERANCES FROM BAR STOCK AT AMBIENT TEMPERATURES.						

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- TRANSMISSION (CONTINUED)							
(6092)	TITLE - AUSROLLED GEARS FOR TACTICAL VEHICLES				350		
	PROBLEM - THE PRESENT PROCESS FOR MAKING HIGH PERFORMANCE GEARS IS EXPENSIVE. THE FINAL GRIND IS ESPECIALLY EXPENSIVE AND INTRODUCES SURFACE CONDITIONS WHICH CAN SHORTEN GEAR LIFE.						
	SOLUTION - ESTABLISH PARAMETERS TO ENABLE USE OF THE AUSROLLING PROCESS FOR FINAL FINISH. THIS WILL ELIMINATE THE NEED FOR FINAL GRINDING.						

CATEGORY
GENERAL

COMPONENT -- MISCELLANEOUS							
(5082)	TITLE - FLEXIBLE MACHINING SYSTEM PILOT LINE FOR TCV COMPONENT	3290	350				
	PROBLEM - PARTS FOR TRACKED COMBAT VEHICLES ARE TYPICALLY NOT MANUFACTURED IN LARGE QUANTITIES. BECAUSE OF THIS, MASS PDN TECHNOLOGIES THAT RESULT IN LOWER PDN COSTS ARE NOT USED.						
	SOLUTION - THE ADVANTAGES OF MASS PDN CAN BE REALIZED IN PRODUCING MEDIUM QUANTITY SIZE LOTS BY A CONCEPT KNOWN AS, FLEXIBLE MACHINING SYSTEMS. THIS PROJECT WILL ADVANCE THE FMS TECHNOLOGY MAKING IT FEASIBLE TO UTILIZE FMS FOR THE MFG OF ARMY MATERIEL.						
(5090)	TITLE - IMPROVED AND COST EFFECTIVE MACHINING TECHNOLOGY	964	350				
	PROBLEM - MACHINE DATA ON NEWER MATERIALS AND NEW REMOVAL RATES ARE NOT ESTABLISHED.						
	SOLUTION - ESTABLISH DATA WHEREAS THE NEW MACHINING EQUIPMENT MAY BE UTILIZED WITH MAXIMUM EFFICIENCY.						
(5093)	TITLE - HIGH SPEED MACHINING OF ALUMINUM TCV COMPONENTS					500	550
	PROBLEM - FAST CHIP REMOVAL FOR ALUMINUM ALLOYS HAVE NOT BEEN ESTABLISHED FOR PRODUCTION.						
	SOLUTION - ESTABLISH FAST CHIP REMOVAL FOR PRODUCTION CONDITIONS.						
(6054)	TITLE - ADVANCED METROLOGY SYSTEMS INTEGRATION	898	100			1000	1800
	PROBLEM - THE METROLOGY METHODS USED IN MILITARY VEHICLE MANUFACTURE, IN GENERAL, EMPLOYS CONTACT GAUGES MANUALLY EMPLOYED. THIS REPRESENTS A SUBSTANTIAL PART OF THE COST OF OUR MILITARY VEHICLES.						
	SOLUTION - NON-CONTACT, IN-PROCESS GAUGING (ELECTRO-OPTICAL AND LASER) WILL BE ADAPTED TO A VEHICLE MACHINING OPERATION. SOLID PHOTOGRAPHY WILL BE ADAPTED TO MEET THE MEASURING REQUIREMENTS OF COMPONENTS SUCH AS TURBINE BLADES.						

	FUNDING ($000)				
	PRIOR	83	84	85	86	87
COMPONENT -- MISCELLANEOUS (CONTINUED)						
(6086) TITLE - CAD/CAM PROCESSES FOR ALUMINUM CASTINGS (PHASE 1)					600	550
PROBLEM - THE CASTING PROCESS IS WASTEFUL OF RAW MATERIALS AND ENERGY. ABOUT 50% MORE MATERIAL IS MELTED THAN UTILIZED IN THE FINAL CAST CONFIGURATION.						
SOLUTION - APPLICATION OF ADVANCED FLUID AND THERMAL ANALYSIS FOR THE ALUMINUM CASTING PROCESS WILL RESULT IN MORE EFFICIENT UTILIZATION OF CASTING FACILITIES. TWO MAJOR TASKS WILL ADDRESS CONVENTIONAL SAND CAST AND DIE CAST PROCESSES.						
(6118) TITLE - FLEXIBLE FIXTURING SYSTEMS						200
PROBLEM - THE COST TO DESIGN AND CONSTRUCT MACHINE FIXTURES USED IN PROTOTYPE PRODUCTION IS EXCESSIVELY HIGH.						
SOLUTION - PURCHASE AND TEST A FLEXIBLE FIXTURING SYSTEM UNDER WORKING CONDITIONS.						
(6121) TITLE - CAD/CAM FOR THE BRADLEY FIGHTING VEHICLE						1250
PROBLEM - MANUFACTURING TECHNIQUES FOR THE BFV ARE IN NEED OF IMPROVEMENT IN THE AREA MATERIAL SELECTION, MANUFACTURING PRINCIPALS, AND QUALITY CONTROL. IN ADDITION CURRENT TECHNIQUES ARE EXTREMELY LABOR INTENSIVE.						
SOLUTION - IMPLEMENT THE FOLLOWING SUBTASKS TO IMPROVE THE BFV; ROBOTIC WELDING, ROBOTIC HARNESS ASSY, ADAPTIVE CONTROL + CUTTER SENSING, AUTOMATED PART GAUGING + INSPECTION, AND MANUFACTURING CELL WITH ROBOTIC LOADING.						

CATEGORY
IPIP

COMPONENT -- MISCELLANEOUS

(4006) TITLE - BRADLEY FVS IPI PROGRAM			3000	4000	2000	
PROBLEM - EXCESSIVE MANUFACTURING COSTS WITH LOW DELIVERY SCHEDULES ARE THE RESULTS OF PROBLEMS WITH EQUIPMENT, FIXTURING, PROCESSING, INSPECTION TECHNIQUES, AND RAMP-UP.						
SOLUTION - CONDUCT AN ANALYSES OF FMC FACILITIES INVOLVED WITH THE FABRICATON OF THE BFVS WITH A FOCUS ON PRODUCTIVITY, COST SAVINGS, AND PLANT MODERNIZATION.						

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- MISCELLANEOUS (CONTINUED)							
(6089)	TITLE - ABRAMS TANK PRODUCTIVITY IMPROVEMENT (PHASE I)	100		1500	3000	1000	700
	PROBLEM - DETROIT, STERLING HEIGHTS + SCRANTON FACILITIES PROVIDE COMPONENTS AND PRODUCE THE ABRAMS TANK. PROBLEMS OCCUR W/ EQUIP, FIXTURES, PROCESSING + INSPECT TECHNIQUES RESULTING IN EXCESSIVE COSTS + LOW DELIVERY RATES.						
	SOLUTION - ANALYZE THESE TANK PLANTS FOCUSING ON PRODUCTIVITY, COST SAVINGS AND MODERNIZATION. DEVELOP A MFG ENVIRONMENT AND IMPLEMENTATION PLAN TO REDUCE COSTS TO ARMY, IMPROVE PRODUCTIVITY AND INSURE TIMELY DELIVERIES.						
(6090)	TITLE - TOOELE ARMY DEPOT PRODUCTIVITY IMPROVEMENT PROGRAM			1800	2000	650	500
	PROBLEM - THE AGING FACILITY AND OUTDATED TECHNIQUES HAVE RESULTED IN AN INEFFICIENT OPERATION AND SLOW DELIVERIES.						
	SOLUTION - DEVELOP AND DEFINE AN ENVIRONMENT AND IMPLEMENTATION PLAN TO IMPROVE PRODUCTIVITY, REDUCE REFURBISHING COSTS TO THE ARMY, AND INSURE TIMELY DELIVERY.						
(6095)	TITLE - ABRAMS TRANSMISSION PRODUCTIVITY IMPROVEMENTS		176	300	1145	800	
	PROBLEM - A NUMBER OF TECHNOLOGICAL AREAS HAVE BEEN IDENTIFIED WHICH CAN BE APPLIED AS COST REDUCING MEASURES OR AS A MEANS OF IMPROVING THE MANUFACTURE COST OF THE M1 ABRAM TRANSMISSION.						
	SOLUTION - THE TECHNOLOGICAL AREAS WILL BE SEPARATED INTO 4 TASKS. A FINAL REPORT WILL BE GENERATED FOR EACH TASK ALONG WITH PILOT HARDWARE AND/OR CHANGES TO THE TECHNICAL DATA PACKAGE AS APPROPRIATE TO ACCOMMODATE IMPLEMENTATION.						

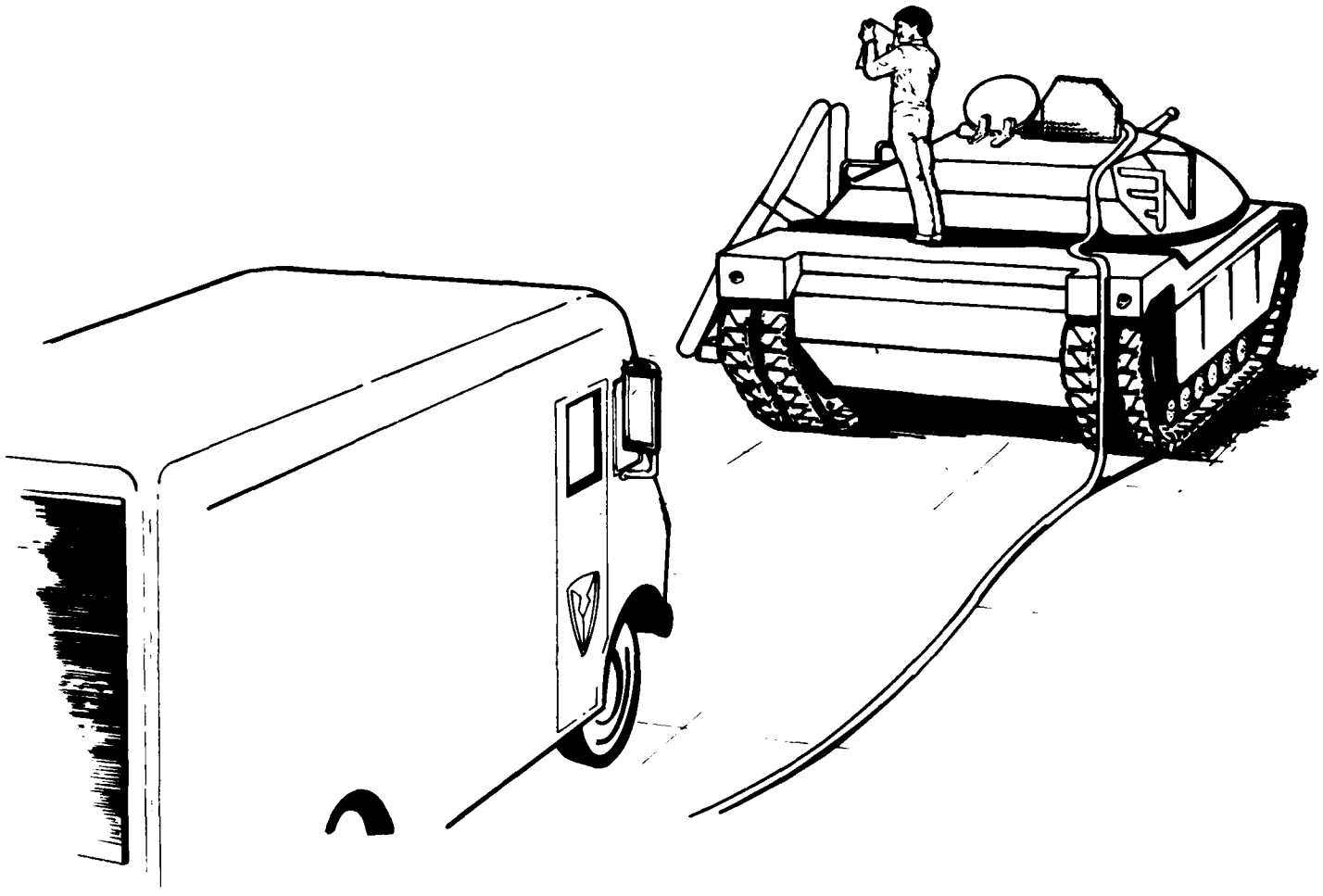
CATEGORY
SUSPENSION SYSTEM

COMPONENT -- TORSION BAR/TUBE

(5074)	TITLE - PRODUCTION TECHNIQUES FOR COMBAT VEHICLE SUSPENSION SYSTEMS						1250
	PROBLEM - SUSPENSION SYSTEMS OF COMBAT VEHICLES ARE UNDERGOING A LARGE DESIGN CHANGE TO PROVIDE INCREASED MOBILITY PERFORMANCE BY UTILIZING NEWLY DEVELOPED COMPONENTS. APPLICATION OF THE ADVANCED SYSTEMS WILL INCREASE ACQUISITION COSTS.						
	SOLUTION - APPLY ADVANCED MANUFACTURING TECHNIQUES TO REDUCE OR PREVENT INCREASES IN THE ACQUISITION COSTS.						

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- TORSION BAR/TUBE (CONTINUED)							
(6029)	TITLE - MANUFACTURING PROCESS FOR METAL MATRIX COMPOSITES					500	800
	PROBLEM - METAL MATRIX COMPOSITES MAKE POSSIBLE COMPONENTS HAVING REDUCED WEIGHT AND INCREASED STRENGTH THE MANUFACTURING METHODS FOR PRODUCTION MUST BE DEVELOPED BY UPSCALING LAB METHODS.						
	SOLUTION - UPSCALE AND OPTIMIZE MANUFACTURING METHODS.						
COMPONENT -- WHEELS							
(5038)	TITLE - NON-PNEUMATIC COMBAT TIRE FABRICATION TECHNIQUES				225	300	400
	PROBLEM - PNEUMATIC TIRES ON TACTICAL VEHICLES ARE SUBJECT TO COMBAT DAMAGE.						
	SOLUTION - ESTABLISH PROCESSING TECHNIQUES TO ASSURE RELIABLE HIGH MOBILITY, NON-PNEUMATIC TIRES.						
********** CATEGORY ********** TESTING **********							
COMPONENT -- NON-DESTRUCTIVE TESTING							
(6078)	TITLE - AUTO DYNAMOMETER CONTROL FOR STANDARDIZED INSPECTION TESTING						1150
	PROBLEM - CURRENTLY, ENGINE OVERHAUL REQUIRES APPROXIMATELY ONE THIRD OF THE ACTUAL OVERHAUL COST BECAUSE THE ACCEPTABILITY CRITERIA SPECIFIES A 4 HOUR DYNAMOMETER TEST FOR REBUILT ENGINES.						
	SOLUTION - THIS PROJECT WILL AUTOMATE A CURRENT MANUAL DYNAMOMETER TEST CELL AND REDUCE REBUILD ENGINE ACCEPTANCE TEST RUN-IN TIME BY IMPLEMENTING COMMERCIALLY AVAILABLE INSPECTION DIAGNOSTIC EQUIPMENT AND SOFTWARE.						
********** CATEGORY ********** TRACK **********							
COMPONENT -- RUBBER PADS							
(5075)	TITLE - RUBBER FOR MILITARY TRACK	400	250			250	350
	PROBLEM - TRACK LIFE IS HELD AT ITS PRESENT LEVEL BY FAILURE OF RUBBER COMPONENTS SUCH AS BUSHINGS, PADS AND BLOCKS.						
	SOLUTION - ESTABLISH PRODUCTION PROCESSES FOR NEWLY DEVELOPED ELASTOMER COMPOUNDS FOR TRACKS.						

		FUNDING ($000)				
	PRIOR	83	84	85	86	87
COMPONENT -- SHOES						
(4513) TITLE - HIGH DENSITY POWDER METAL PARTS FOR COMBAT VEHICLES						550
PROBLEM - TRACK COMPONENTS WEAR EXCESSIVELY REQUIRING THE TRACK TO BE ADJUSTED AND/OR REPLACED FREQUENTLY.						
SOLUTION - FABRICATE COMPONENTS BY COMPACTING HIGH WEAR ALLOYS FROM POWDER.						
(4514) TITLE - HARD FACING OF TRACK SHOES					150	200
PROBLEM - NO DEFINITE PROCEDURE AND HARD FACING MATERIALS HAVE BEEN ESTABLISHED AS THE MOST SATISFACTORY REPAIR COMBINATION FOR TRACK SHOES. PRIOR EFFORTS HAVE BEEN MADE IN BOTH THE USA AND EUROPE BUT NOTHING DEFINITE HAS RESULTED.						
SOLUTION - THE TRACK SHOE GROUSERS WILL BE BUILT UP BY DEPOSITION USING A HARD FACING PROCESS. THE PROCESS WILL BE AUTOMATED AND TOOLING WILL BE DESIGNED TO ALLOW THE EQUIPMENT TO FOLLOW THE CONTOURS OF THE TRACK SHOE GROUSERS.						
(6107) TITLE - IMPROVED MBT TRACK	193	1000		625	1000	
PROBLEM - INCREASED VEHICLE PERFORMANCE REQUIREMENTS NECESSITATE HIGHER PERFORMANCE TRACKS THAN THOSE AVAILABLE TODAY. TO IMPLEMENT NEW METAL COMPOSITE, HIGHER STRENGTH FERROUS ALLOYS, AND TITANIUM NEW MANUFACTURING PROCESSES MUST BE ESTABLISHED.						
SOLUTION - TO IMPLEMENT NEW MATERIAL TRACK SHOES AND PINS, INVESTMENT CASTING AND HOT MOLDING TECHNIQUES WILL BE ESTABLISHED FOR METAL MATRIX COMPOSITES.						



TEST AND EVALUATION COMMAND
(TECOM)

US ARMY TEST AND EVALUATION COMMAND

(TECOM)

TECOM, with headquarters at Aberdeen Proving Ground, MD, is the primary developmental testing agency for the US Army. TECOM plans, conducts, and reports on development tests performed during the life cycle of Army materiel, and evaluates foreign materiel for possible US acquisition. Additional testing is performed as a service to the commodity commands upon their request. The testing organization consists of the aircraft development test activity, three environmental testing activities, five proving grounds (one of which serves as the third environmental activity), and a national missile range. Facilities are located in the continental United States, the Panama Canal Zone and Alaska.

Individual investigations into production test procedures and evaluation techniques are accomplished through TECOM's MMT program. In view of TECOM's mission and the intended results of the MMT efforts (to improve test procedures), the majority of the work is accomplished in-house.

TECOM's MMT efforts are grouped under two general headings: documentation and resource conservation. Individual efforts are funded from these "parent programs." Current funding constrains TECOM to an annual program that supports approximately one-half of their planned efforts.

TECOM

COMMAND FUNDING SUMMARY
(THOUSANDS)

CATEGORY	FY83	FY84	FY85	FY86	FY87
TESTING	438	1100	1200	1300	1400
TOTAL	438	1100	1200	1300	1400

CATEGORY
TESTING

			FUNDING ($000)				
		PRIOR	83	84	85	86	87
COMPONENT -- DOCUMENTATION							
(5072)	TITLE - TECOM PRODUCTION TEST METHODOLOGY ENGINEERING MEASURES		165	413	452	488	523
	PROBLEM - STANDARD TEST PROCEDURES ARE REQUIRED TO INSURE THAT TEST ACTIVITIES COLLECT DATA AND CONDUCT TESTS IN A UNIFORM MANNER TO SUPPORT THE DT EVALUATION PROCESS. ACCEPTANCE TEST PROCEDURES ARE REQUIRED TO VERIFY PRN HARDWARE SPECIFICATION COMPLIANCE.						
	SOLUTION - MAINTAIN TEST OPERATIONS PROCEDURES AND ACCEPTANCE TEST PROCEDURES TO TEST SYSTEMS FOR SPECIFICATION COMPLIANCE.						
COMPONENT -- RESOURCE CONSERVATION							
(5071)	TITLE - TECOM PRODUCTION METHODOLOGY ENGINEERING MEASURES	6406	197	494	540	584	630
	PROBLEM - ARTILLERY,VEHICLE AND ELECTRONIC CONVENTIONAL TEST CAPABILITIES NEED TO BE UPGRADED TO PROVIDE MORE TIMELY ACCURATE TEST DATA FOR THE TEST AND EVALUATION PROCESS.						
	SOLUTION - DEVELOP A PROGRAM TO UPGRADE CONVENTIAL TEST CAPABILITIES AT THE TEST ACTIVITIES.						
(5073)	TITLE - TECOM PRODUCTION TEST METHODOLOGY ENGINEERING MEASURES		76	193	208	228	247
	PROBLEM - FIELD TESTING COMPLEX WEAPON SYSTEMS IS COST PROHIBITIVE. SIM TECHNIQUES MUST BE DEVELOPED TO REDUCE THE COST AND MANPOWER REQUIRED TO PERFORM GOVT TESTS ROUTINE. PDN TEST PROCESSES MUST BE AUTOMATED BECAUSE OF PERSONNEL REDUCTIONS AT TEST ACTIVITIES						
	SOLUTION - DEVELOP SIMULATION TECHNIQUES TO TEST COMPLEX WEAPON SYSTEMS AND AUTOMATE PRODUCTION TEST PROCESSES.						

TROOP SUPPORT AND AVIATION MATERIEL READINESS COMMAND (TSARCOM)

US ARMY TROOP SUPPORT AND AVIATION MATERIEL READINESS COMMAND

(TSARCOM)

The US Army Troop Support and Aviation Materiel Readiness Command (TSARCOM) was established on 1 July 1977 in St. Louis, Missouri. TSARCOM's mission is to provide positive readiness support for 23 major categories of equipment to the entire Department of Defense and 80 foreign countries. The diverse mission ranges from fixed-wing and rotary-wing aircraft to a fleet of amphibians and watercraft, and field support items such as generators, bridges, water purifiers, camouflage, mine detectors, air conditioners and heaters, fuel storage and distribution equipment, compasses and surveying instruments.

The focal point of TSARCOM's technology effort is the manufacturing facilities for turbine engines. Stratford Army Engine Plant, operated by AVCO-Lycoming, is the subject of the Army's first Industrial Productivity Improvement effort. The goal is to reduce the costs of the T-53, T-55, and AGT-1500 engines by modernizing the plant's management systems, manufacturing methods, processes, production equipment, and computer aided manufacturing systems.

TSARCOM

COMMAND FUNDING SUMMARY
(THOUSANDS)

CATEGORY	FY83	FY84	FY85	FY86	FY87
IPIP	0	1000	4000	2000	2900
TOTAL	0	1000	4000	2000	2900

CATEGORY
IPIP

MMT PROGRAM PLAN
RCS DRCMT 126

		FUNDING ($000)					
		PRIOR	83	84	85	86	87
COMPONENT -- MISCELLANEOUS							
(8192)	TITLE - TURBINE ENGINE PRODUCTIVITY IMPROVEMENT	3898		1000			
	PROBLEM - THE STRATFORD ARMY ENGINE PLANT (SAEP) IS IN NEED OF MODERNIZATION. BOTH THE PLANT AND NEARLY 50 PERCENT OF TE EQUIPMENT IS OVER 25 YEARS OLD. A COMBINATION OF AGING MFG FACILITIES, METHODS, PROCESSES, ETC., HAVE RESULTED IN EXCESSIVE MFG COSTS.						
	SOLUTION - THE THRUST OF THIS PROJECT IS TO ANALYZE THE ENTIRE SAEP FACILITY WITH A FOCUS ON PRODUCTIVITY, COST SAVINGS AND PLANT MODERNIZATION. AREAS TO BE EVALUATED INCLUDE BOTH MGT AND BUSINESS SYSTEMS EG. MFG METHODS, PROCESSES, EQUIP, FACILITIES, AND CAM						
(8193)	TITLE - MMT AIRCRAFT MANUFACTURING PRODUCTIVITY IMPROVEMENT				2000	1000	1500
	PROBLEM - THE EXISTING SIKORSKY MANUFACTURING FACILITIES,METHODS, PROCESSES, ETC., HAVE RESULTED IN EXCESSIVE MANUFACTURING COSTS COUPLED WITH SLOW DELIVERIES.						
	SOLUTION - ANALYZE SIKORSKY MANUFACTURING FACILITY FOR PRODUCTIVITY, COST SAVINGS, AND PLANT MODERNIZATION. DEFINE AND DEVELOP A MANUFACTURING ENVIRONMENT AND IMPLEMENTATION PLAN TO REDUCE ARMY COSTS, IMPROVE PRODUCTIVITY, AND INSURE TIMELY DELIVERIES.						
(8198)	TITLE - T-700 TURBINE ENGINE MFG PRODUCTIVITY IMPROVEMENT				2000	1000	1400
	PROBLEM - INITIAL INVESTIGATION GE PLANTS INDICATE ADVANCED TECHNOLOGY AND COST IMPROVEMENT CONCEPTS CAN BE APPLIED TO THE MANUFACTURING PROCESSES, EQUIPMENT AND SUPPORT SYSTEMS TO REDUCE COST AND IMPROVE PRODUCTIVITY.						
	SOLUTION - THIS IS FIRST OF 3 PHASE PROGRAM. PHASE I ANALYSIS AND CONCEPTUAL DESIGN PHASE II DESIGN DEVELOP AND DEMONSTRATE IMPROVED PROCESSES MANUFACTURING SYSTEMS AND SOFTWARE SUPPORT PHASE III IMPLEMENT IMPROVED PROCESSES, SYSTEM, AND SOFTWARE SUPPORT.						

APPENDICES

INDUSTRY GUIDE

This section of the MMT Program Plan explains the Army programming cycle for the MMT Program. The objective of the MMT Program is to develop new manufacturing methods and processes that will reduce the cost of producing weapon systems. The program consists of approximately 200 projects annually that concentrate on improving and/or developing manufacturing methods, techniques and processes.

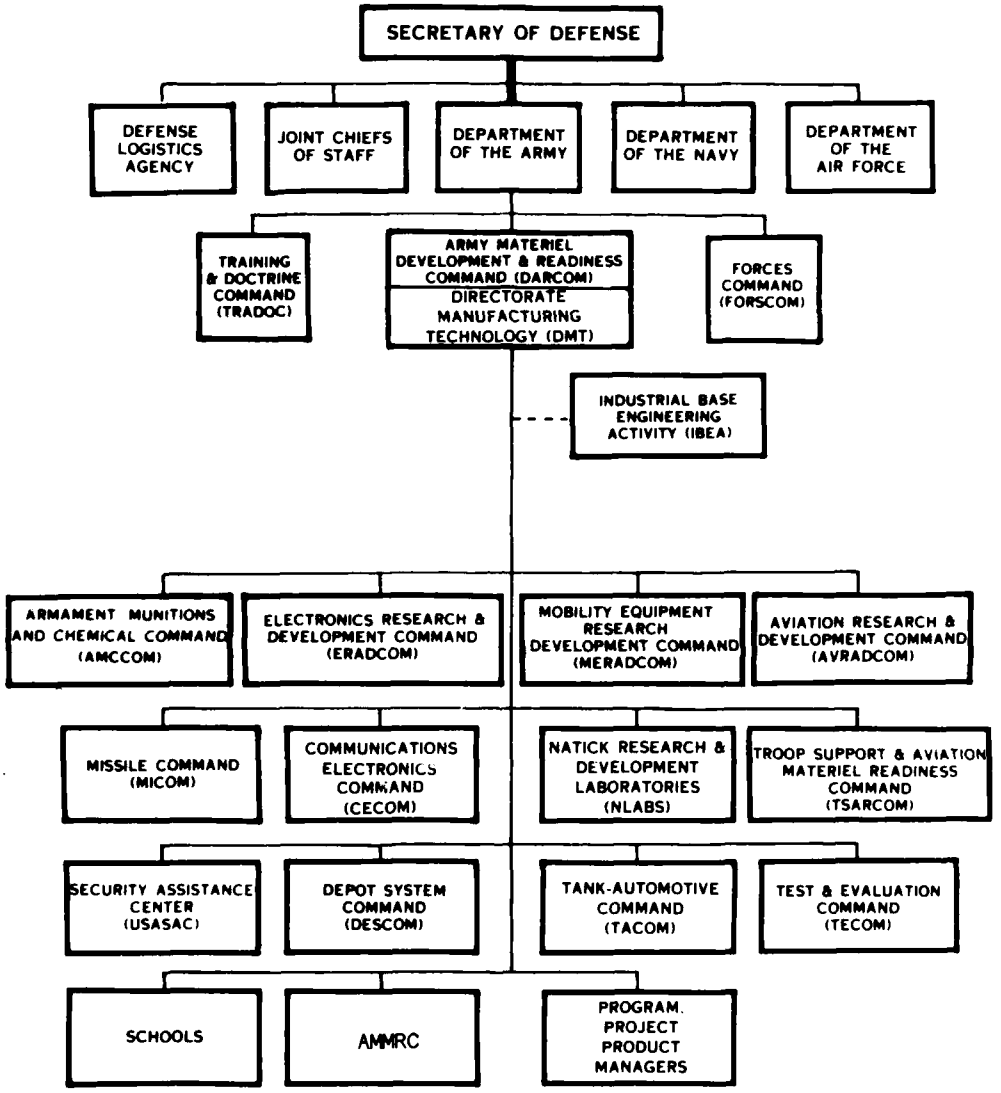
Within the Army, the Directorate for Manufacturing Technology (DMT) has been established to provide overall program responsibility. Functional responsibility is at the commodity oriented, Major Subcommands (SUBMACOM'S). The SUBMACOM'S plan, formulate, budget, and execute individual projects. The Industrial Base Engineering Activity (IBEA) assists DMT on the technical aspects of the Manufacturing Technology Program. The organizational chart on the next page depicts this supporting framework.

Throughout the Program Plan reference is made to various appropriations. These appropriations are identified in the Army Management Structure (AR 37-100-FY) and are established by the US Congress as a standard accounting system. Most MMT efforts are funded through the Procurement Appropriations which include (1) Aircraft, (2) Missile, (3) Weapons and Tracked Combat Vehicles, (4) Ammunition, and (5) Other. A few projects receive funds from the Operations Maintenance, Army (OMA) appropriation.

Identification of manufacturing problems is the first step in developing an MMT Program. Problem areas are conceptualized and compiled into a planning document (the Program Plan). At the date of the publication, the Program Plan contains one funded year, two programmed years and two planned years. As the program cycle proceeds the concepts are refined and project proposals are developed. A diagram depicting this programming cycle is shown on page A-3. To fully understand the entire programming cycle one must realize that DOD budgets on a Fiscal Year (FY). The FY starts on 1 October and ends the last day of the following September. For example, on 1 October 1983, the Army will begin the first quarter of FY 84.

The following programming cycle chart depicts the various activities and stages that MMT projects go through. Concepts are first identified in the five year plan according to the projected year funding is expected. Each year these concepts are reevaluated and move forward until they reach the budget phase. Industry has the opportunity to participate in the evaluation of these projects by voicing comments during the annual MTAG conference. At this gathering the current program, the latest budget project and the Program Plan are discussed.

UNITED STATES ARMY MATERIEL DEVELOPMENT & READINESS COMMAND (DARCOM)



Calender Year Activities
MMT Planning/Budgeting/Review Cycle

YEARLY ACTIVITIES

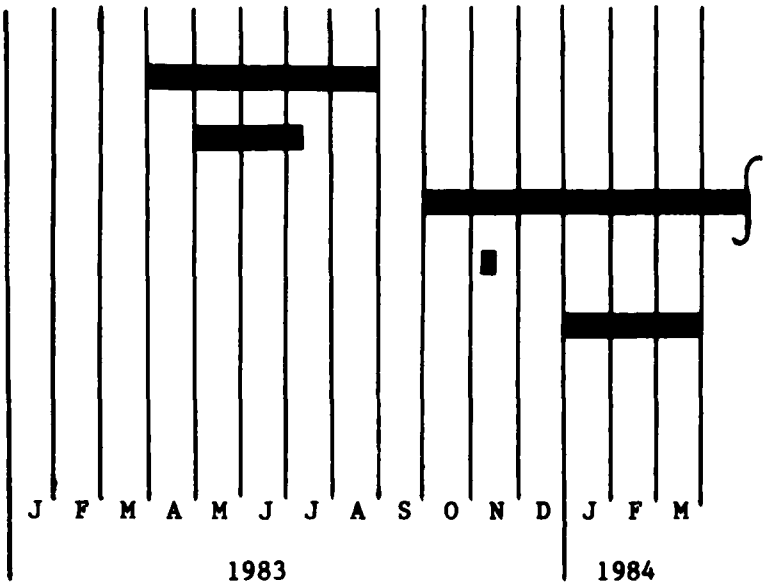
Program Plan (FY83-87)

FY85 Budget Submission/Review

FY84 MMT Funds Released

MTAG Annual Conference

FY85 Apportionment Submission/ Review



The programming cycle shown above starts with the Program Plan. This document consolidates individual submissions from the SUBMACOM'S and develops the planned program. Because Army budget guidance provides "ceilings," potential projects must be prioritized which results in some being excluded or slipped. Inclusion in the Plan does not guarantee that the project will be funded. The level of funding is dependent upon Congressional appropriations.

As projects approach the start of the funding cycle specific objectives and work scopes are developed. These projects are documented in what is known as a P-16. A P-16 is simply the format that is utilized to document data elements such as estimated cost, economics, and description of work. (The P-16 format is described in AR 700-90).

The budget submission represents the first P-16 submitted for inclusion in the program. This submission is followed about nine months later by the more definite apportionment submission. Projects are then funded when the new fiscal year begins. Although this is the normal planning cycle, a project can enter the planning cycle at any point in time. Such a project would be known as a late start submission and funding is usually at the expense of another project.

Criteria for funding individual projects include technical, operational, and economical feasibility. Evaluation includes the potential for technical success, the means by which the results will be implemented, the potential payback or return on investment and the interrelationships that exist between these factors.

For a more comprehensive understanding of the MMT program, the following list of documents is provided for reference:

DOD Instruction 4200.15, Manufacturing Technology Program

AR 700-90, The Army Industrial Preparedness Program

AR 37-100, The Army Management Structure

AR 11-28, Economic Analysis and Program Evaluation for Resources Management

PROCESS TECHNOLOGY INDEX

The projects fully described in the body of this document are grouped into "Categories" and "Components" which are end item type descriptors. This appendix again lists all the projects, less Problem and Solution statements, and groups them by technical areas. The primary grouping of this appendix is by the primary Manufacturing Technology Advisory Group (MTAG) subcommittee designator (i.e., CAD/CAM, Electronics, Metals, Non-Metals, Munitions, and Test & Inspection). Within each MTAG group, projects are further grouped alphabetically by process.

****
* COMPUTER AIDED DESIGN/COMPUTER AIDED MANUFACTURING *
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PROCESS	COMMAND	EFFORT	EFFORT TITLE	FY	COST	PAGE
ASSEMBLY	AMCCOM	- L222	BORESIGHTING OF SFF WHD W/IR SENSOR	86	200	41
				87	115	
	AMCCOM	- 4062	AUTO MFG SUP FOR MORTAR INCREMENT CONTAINERS	83	250	44
	AMCCOM	- 8468	IMPR MFG PLUS HANDLING TECHNIQUES FOR SMALL CAL WEAPONS	86	215	98
				87	325	
	AVRADCOM	- 7503	ROBOTIC RIVETING SYSTEM	87	400	109
	MICOM	- 1109	ROBOTIZED WIRE HARNESS ASSEMBLY SYSTEM	84	1000	185
	MICOM	- 1117	ROBOTIC PRINTED WIRING BOARD (PWB) ASSEMBLY	87	450	185
CASTING	AMCCOM	- 8509	COMPUTERIZED FOUNDRY MELT COMPOSITION CONTROL (CAM)	85	77	79
				86	140	
	AMCCOM	- 8704	ROBOTICS FOR CLEANING CASTINGS	87	205	74
	TACOM	- 6086	CAD/CAM PROCESSES FOR ALUMINUM CASTINGS (PHASE I)	87	550	220
				86	600	
COATING	DESCOM	- 0002	CAM APPLICATION OF ROBOTICS TO SHELTER REFINISHING	83	50	152
				84	370	
	DESCOM	- 4006	ROBOTIC POLYURETHANE CAMOUFLAGE PAINTING	86	325	151
				87	225	
	DESCOM	- 7002	ROBOTIC POLYURETHANE CAMOUFLAGE PAINTING OF WHEELED VEHICLES	85	550	151
				86	356	
ENGRAVING	DESCOM	- 2004	PROTOTYPE ROBOT AUGMENTED LASER GRAPHICS ENGRAVING	85	99	153
				86	300	
EXTRUSION	AVRADCOM	- 7360	EXTRUSION OF PRECISION HOLLOW AIRCRAFT COMPONENTS	87	250	125
FABRICATION	AMCCOM	- 8701	APPLICATION OF ROBOTIZED WORKPIECE HANDLING AND FIXTURING	87	100	88
	MICOM	- 1064	PRODUCTION OF INFRARED SEEKER ELECTRONICS USING VLSI (CAM)	87	400	190
	MICOM	- 3108	MISSILE/ROCKET DISPENSING SYSTEM	87	350	183
	TACOM	- 5082	FLEXIBLE MACHINING SYSTEM PILOT LINE FOR TCV COMPONENT	83	350	219
FORGING	AVRADCOM	- 7443	ROBOTICS FOR HIGH PRODUCTIVITY FORGINGS	84	225	121
				85	430	
				86	215	
	TACOM	- 5005	COLD FORGED GEARS TO DRAWING TOLERANCES	83	300	218
GENERAL	AMCCOM	- 8532	ARMCAM FOR FUTURE CAM ACTIVITIES	86	120	73
	AMCCOM	- 8702	ROBOT APPLICATION IN BATCH MFG (CAM)	85	350	76
	AVRADCOM	- 7403	ELECTRONIC BLADE BALANCE SYSTEM	87	275	123
	DESCOM	- 0050	PORTABILITY OF DATA ACROSS ALL CAD/CAM RESOURCES	86	300	153
				87	200	
GRINDING	AMCCOM	- 8120	ADAPTIVE CONTROL TECHNOLOGY (CAM)	83	495	76
				85	200	
				81	225	
	AMCCOM	- 8700	APPLICATION OF ENERGY-ADAPTIVE CONTROLS TO GRINDING (CAM)	87	125	88
GROUP TECHNOLOGY	AMCCOM	- 4464	COMPUTER/GROUP TECHNOLOGY FOR SMALL CAL AMMO	86	269	63
				87	225	
	AMCCOM	- 7724	GROUP TECHNOLOGY OF WEAPON SYSTEMS	83	250	86
				81	180	

PROCESS	COMMAND	EFFORT	EFFORT TITLE	FY	COST	PAGE
GROUP TECHNOLOGY	AMCCOM	- 8525	GROUP TECHNOLOGY FOR S/C COMPONENT	86	115	99
				87	160	
HEAT TREATMENT	AMCCOM	- 8403	DESIGN CRITERIA FOR HARDENING (CAM)	86	110	78
				84	261	
	AVRADCOM	- 7440	CAD/CAM FOR THERMAL ENERGY CONSERVATION IN MFG. PROCESS	86	175	128
				87	250	
INSPECTION	AMCCOM	- 1802	AUTOMATED OPTICAL MICROELECTRONICS INSPECTION	84	996	43
	AMCCOM	- 3717	APPLICATION OF RAPID X-RAY TECHNIQUE	86	2100	59
	AMCCOM	- 8415	ROBOTIC EMPLACEMENT DEVICE FOR INSPECTION BY X-RAY (REDIX)	86	180	95
IPIP	AVRADCOM	- 7433	INDUSTRIAL PRODUCTIVITY IMPROVEMENT PROGRAM- AHIP	83	1200	122
				85	3000	
				86	1000	
				87	1000	
	DESCOM	- 8001	INDUSTRIAL PRODUCTIVITY IMPROVEMENT PROGRAM	84	1500	153
				85	1500	
	TACOM	- 6089	ABRAMS TANK PRODUCTIVITY IMPROVEMENT (PHASE I)	84	1500	221
				85	3000	
				86	1000	
				87	700	
	TSARCOM	- 8193	MMT AIRCRAFT MANUFACTURING PRODUCTIVITY IMPROVEMENT	85	2000	235
				86	1000	
				87	1500	
MACHINING	AMCCOM	- 8416	FLEXIBLE MACHINING SYSTEM-RIA (CAM)	84	399	73
				85	178	
	AMCCOM	- 8514	OPTIMIZATION OF MACHINING PARAMETERS	86	80	79
				87	80	
	AMCCOM	- 8604	MACHINEABILITY DATA BASE	86	155	81
	AVRADCOM	- 7477	UNMANNED MACHINING CELL	86	225	131
				87	500	
MOLDING, INJECTION	DESCOM	- 4003	RUBBER INJECTION MOLDING OF DOUBLE PIN TRACK	86	341	154
				85	200	
PLATING	AMCCOM	- 8243	COMPUTER CONTROLLED CHROMIUM PLATING PROCESS	83	260	90
POWDER METALLURGY	AVRADCOM	- 7361	COMPUTER AIDED HIP OF ENGINE DISKS	87	325	131
PROCESS CONTROL	AMCCOM	- 8132	PERFORMANCE MEASUREMENT PARAMETERS FOR GOGO MFG.	86	100	74
	AMCCOM	- 8154	COMPUTER INTEGRATION MFG (CIM), DDNC	83	650	72
				84	450	
	AMCCOM	- 8241	COMPUTER APPLICATIONS TO BORE GUIDANCE	84	85	90
	AMCCOM	- 8305	INTEGRATED MANUFACTURING SYSTEM(ICAM)	83	75	75
				84	2094	
				85	950	
				86	1360	
				87	1020	
	AMCCOM	- 8306	ON-LINE PRODUCTION INFORMATION SYSTEM (CAM)	83	200	75
				84	571	

PROCESS	COMMAND	EFFORT	EFFORT TITLE	FY	COST	PAGE
	AMCCOM	- 8327	COMPUTER INTEGRATED MFG (CIM F/FC MATERIAL) (CAM)	86	210	71
				87	225	
	AMCCOM	- 8417	FACTORY INFORMATION MANAGEMENT - RIA (CAM)	84	280	75
	AMCCOM	- 8512	ADVANCED COMPUTER AIDED PROCESS PLANNING (CAM)	86	70	79
				87	130	
	AMCCOM	- 8559	CIM FOR CANNON CAD/CAM/COMM	85	1160	75
				86	490	
				87	515	
PROCESS CONTROL	AVRADCOM	- 7345	IN-PROCESS CONTROL OF RESIN MATRIX CURE	87	300	125
	AVRADCOM	- 7507	MANUFACTURING FINISH PROCESSES PROCESSING CENTER PLAN	86	1500	109
				87	500	
	MICOM	- 3152	PRODUCTION OF OPTICAL ELEMENTS (CAM)	87	300	189
	MICOM	- 3233	COMPUTERIZED INTEGRATED MANUFACTURING SUPPORT (CAM)	87	500	186
	MICOM	- 3238	MANUFACTURING COST ANALYSIS (CAM)	87	200	186
	TACOM	- 6121	CAD/CAM FOR THE BRADLEY FIGHTING VEHICLE	87	1250	189
SURFACE TREATMENT	DESCOM	- 2001	ROBOTS FOR AUTOMATED BLAST CLEANING	83	350	151
				84	500	
TESTING	AMCCOM	- 8628	QA SUPPORT COMPUTER SYSTEM	86	65	26
	TACOM	- 6078	AUTO DYNAMOMETER CONTROL FOR STANDARDIZED INSPECTION TESTING	87	1150	222
WEAVING	MICOM	- 1119	COMPOSITE MILLIMETER ANTENNA WINDOW	87	675	193
WELDING	AMCCOM	- 8424	AUTOMATIC/ROBOTIC WELDING OF WEAPON COMPONENTS (CAM)	84	291	73
	AMCCOM	- 8603	ROBOTIC WELDING	85	285	81
				86	345	
	CECOM	- 3113	ROBOTIC CONTROL OF WELDING AND COATING	86	550	142

****
* ELECTRONICS *
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PROCESS	COMMAND	EFFORT	EFFORT TITLE	FY	COST	PAGE
	AMCCOM	- 8321	ADHESIVE BONDING FC SYSTEMS	86	130	71
				87	230	
	AVRADCOM	- 7470	HAND HELD AUTOMATIC POWER CRIMPER	84	150	106
	AVRADCOM	- 7532	CHIP CARRIER HYBRID PROGRAM	86	300	115
	CECOM	- 3107	REPLACEMENT ELECTRONICS COMPONENTS FOR FIELDED SYSTEMS	87	2200	141
	ERADCOM	- 5037	TWO MEGAWATT HIGH ENERGY LASER SWITCH	86	1120	168
	ERADCOM	- 5059	LINEAR RESONANCE COOLERS - PHASE I	84	500	160
				85	1000	
	ERADCOM	- 5077	2 GEN 8-12 MICRON COMMON MODULE F.P. RETROFIT	86	745	159
				87	1150	
	ERADCOM	- 5108	LOW COST PRECISION MICROWAVE PHASE SHIFTER	86	375	163
	ERADCOM	- 5113	10-MICRON PULSED WAVEGUIDE LASER	85	690	166
	ERADCOM	- 5162	EXJAM BATTERY MANUFACTURING TECHNOLOGY, PHASE I	83	45	168
				84	803	
	ERADCOM	- 5212	MICROELECTRONIC PACKAGES FOR VHSIC	85	600	165
ASSEMBLY	ERADCOM	- 5214	HIGH SPEED D/A CONVERTER FOR VHSIC E-BEAM SYSTEM	85	450	165
	ERADCOM	- 5215	HIGH-SPEED DIGITAL VHSIC MICROCIRCUITS	86	745	165
	ERADCOM	- 5262	VIBRATION IMMUNE LOW PHASE NOISE OSCILLATOR	86	300	162
				87	460	
	ERADCOM	- 5265	INTERNALLY MATCHED POWER FET	86	300	169
				87	500	
	ERADCOM	- 5266	MONOLITHIC BROADBAND BALANCED MIXER	86	225	165
				87	370	
	ERADCOM	- 5268	MEDIUM POWER SOLID STATE TRANSMIT MODULE	87	370	170
	MICOM	- 1105	PRODUCTON METHODS FOR A LOW SIDELOBE ANTENNA NETWORK	87	280	187
	MICOM	- 1141	LOW COST TV SEEKER	85	400	191
				86	400	
	ERADCOM	- 5057	3-5 MICRON TE COOLED FOCAL PLANE MODULES	85	410	159
				86	100	
				87	1120	
BONDING	MICOM	- 1053	MANUFACTURING PROCESS FOR INFRARED FOCAL PLANE ARRAY	87	550	191
	MICOM	- 1097	LOW MASS FIBER CONDUCTOR	86	350	189
				87	350	
	MICOM	- 1099	MFG METH AND TECH F/PIN DIODES AT MILLIMETER WAVE FREQUENCY	87	300	196
	MICOM	- 1103	STABLE MATERIALS + MANUFACTURING FOR MULTILAYER PWB	84	400	185
BRAZING	MICOM	- 1123	IMPROVED MFG PROCESSES STARING FOCAL PLANE ARRAY DETECTORS	86	2000	192
				87	4000	
	MICOM	- 1133	CROSSED FIELD AMPLIFIER (CFA) TECHNOLOGY	85	1316	187
				86	412	
COATING	AMCCOM	- 8329	FIRE CONTROL OPTICAL DEVICES NEW PROCESS PRODUCTION TECH	84	460	71
				85	630	

PROCESS	COMMAND	EFFORT	EFFORT TITLE	FY	COST	PAGE
COATING	CECOM	- 3134	HIGH SHOCK RESISTANT IC MOUNTING STRUCTURE	86	375	143
	CECOM	- 9784	RUGGEDIZED TACTICAL FIBER OPTIC CABLE ASSEMBLY	84	750	144
	MICOM	- 1061	STANDARDIZED MASKING TECHNIQUES FOR PWB ASSEMBLIES	87	250	194
	MICOM	- 1143	LASER SYSTEM E-GUN IMPROVEMENT	87	600	194
CRYSTAL GROWTH	CECOM	- 3108	CONTROL OF GAAS BOULE DIAMETER	85	450	144
	CECOM	- 3110	LASER ANNEALING OF SILICON AND GAAS	86	400	145
	CECOM	- 3121	AUTO COMPOUNDING OF HGCDTE	87	875	139
	ERADCOM	- 5066	1 TO 3 MICRON AVALANCHE DETECTORS	83	470	161
				84	470	
	ERADCOM	- 5222	LC IG LENGTH ND/YAG BOULES	86	360	166
	MICOM	- 1079	WIDE AREA MERCURY-CADMIUM-TELLURIDE QUADRANT DETECTORS	87	350	190
	MICOM	- 1083	IMP MFG PROC F/FOUR-IN DIAMETER FOCAL PLANE ARRAY SEEKERS	87	1000	190
	MICOM	- 1101	SINGLE CRYSTAL SILICON FOR VLSI	87	750	184
	MICOM	- 1104	EPITAXICAL THIN FILM MULTICOLOR IR DETECTOR	85	400	190
				86	400	
	MICOM	- 1120	DETECTOR GRADE CADMIUM SULFIDE (CDS)	85	300	192
				86	450	
CUTTING	CECOM	- 3116	AUTOMATED CUTTING OF HGCDTE CRYSTALS	86	650	139
	ERADCOM	- 5019	LASER-CUT SUBSTRATES FOR MW TUBES	83	408	161
	ERADCOM	- 5232	LOW COST MILLIMETER WAVE FERRITE CIRCULATORS	85	700	167
				86	600	
				87	200	
DEGAUSSING	MERADCOM	- 3796	COMBAT VEHICLE DEPERMING PRODUCTION FACILITY	84	1358	208
				85	1284	
DEPOSITION	AMCCOM	- 8365	RADIAL GRADIENT INDEX OPTICS	85	480	71
				86	220	
				87	245	
	CECOM	- 3138	CHEMICAL VAPOR DEPOSITION OF HGCDTE ON NON-HGCDTE SUBSTRATES	87	900	140
	MICOM	- 1062	PREVENTING BRITTLE COPPER CIRCUITRY	87	380	195
	MICOM	- 1114	IMPROVING THE FABRICATION PROCESSES FOR MICRO-OPTIC GYRO	87	300	188
	MICOM	- 1118	NITRIDE-BASED MILLIMETER ANTENNA WINDOW AND RADOME	87	300	193
	MICOM	- 1131	AN INTEGRATED 94 GHZ SUBMUNITIONS TRANSCEIVER	85	725	187
				86	1075	
	MICOM	- 1140	LASER/RF HARDENING EO/IR + DIRECT VIEW SENSORS	85	400	194
				86	400	
	MICOM	- 3175	MANUFACTURING PROCESSES FOR SOLID STATE IMAGING SENSORS	87	300	192
DIFFUSION	CECOM	- 9290	AUTOMATIC MICROWAVE SEMICONDUCTOR DEVICE TESTING (CAM)	85	500	141
ELECTROFORMING	MICOM	- 1094	PROD METH F/MILLIMTR MONOPULSE ANTENNA F/DIR FIRE APPL	87	1815	187
EPITAXIAL GROWTH	CECOM	- 3068	INCREASE PRODUCIBILITY OF VARACTORS AND PIN DIODES	83	215	145
				84	261	
	ERADCOM	- 3010	MILLIMETER-WAVE SOURCES FOR 60 AND 94 GHZ	83	363	169
				85	650	

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EPITAXIAL GROWTH	ERADCOM	- 5054	MONOLITHICALLY MATCHED POWER GA-AS FETS	86	600	169
	ERADCOM	- 5075	MICROWAVE SILICON FETS	86	600	169
	ERADCOM	- 5111	VAPOR GROWTH FOR 3RD GEN. PHOTOCATHODES	83	650	161
				84	438	
	ERADCOM	- 5151	LIQUID PHASE EPITAXIAL HGCDTE	83	327	160
				84	3235	
	ERADCOM	- 5234	MMT FOR MILLIMETER-WAVE THREE TERMINAL DEVICES	85	1500	164
				86	600	
				87	300	
	ERADCOM	- 5267	MONOLITHIC INP VCO	87	740	163
				88	800	
				89	400	
	MICOM	- 1124	IMPROVED MFG PROC F/8-10 MICRON SCANNING TDI FPA DETECTORS	85	2000	192
				86	4000	
				87	2000	
ETCHING	MICOM	- 1063	SEMIADDITIVE REEL TO REEL FLEX PRINT PROCESS	87	421	184
	MICOM	- 1065	PROD OF QUIET RADAR SIGNAL PROCESSORS USING VLSI TECHNOLOGY	86	450	195
				87	550	
	MICOM	- 1098	LARGE DIAMETER SILICON	87	160	192
GENERAL	AMCCOM	- 3716	SENSOR TECHNOLOGY	86	1000	42
				87	1500	
	AVRADCOM	- 7006	MMT MAN TECHNOLOGY FOR AVIONICS	87	100	113
	AVRADCOM	- 7445	DIGITAL/OPTICAL POSITION TRANSDUCERS	87	800	115
	CECOM	- 3111	MMT AUTOMATIC MATCHING OF IMPEDANCE	85	750	142
	CECOM	- 3120	MILLIMETER WAVE COMPONENTS MANUFACTURE	86	850	145
	CECOM	- 3135	SURFACE-MOUNTED COMPONENT BOARD CLEANING PROCESS	86	375	142
	ERADCOM	- 5049	EBS-CCD ARRAYS (800X800)	86	1120	160
	ERADCOM	- 5088	TWO DIMENSIONAL STARING ARRAYS	87	920	159
	ERADCOM	- 5218	HIGH CURRENT DENSITY CATHODES	85	475	161
	ERADCOM	- 5220	THERMAL WEAPONS SYSTEM (TWS) ELECTRONICS, PHASE I	86	170	161
	ERADCOM	- 5264	PLANAR MONOLITHIC GAAS MIXERS 35, 60, 94 GHZ	86	600	163
				87	740	
	MICOM	- 1054	MANUFACTURING PROCESS FOR HOLOGRAPHIC OPTICAL COMPONENTS	87	375	189
	MICOM	- 1069	MANUFACTURE OF GRADIENT INDEX LENSES	87	300	193
	MICOM	- 1093	PRODUCTION METHODS FOR A MILLIMETER MODULAR TRANSPONDER	87	650	188
	MICOM	- 1139	IMAGE FORMING LIGHT MODULATORS	85	400	189
				86	1139	
	MICOM	- 3177	IMPROVED MANF. PROCESS FOR SUBMISSILE ELECTRONIC SUBSYSTEM	87	250	188
	MICOM	- 3178	IMPROVED MANUFACTURING PROCESSES FOR LASER IR/OPTICAL SEEKER	87	250	191
	MICOM	- 3369	UTILIZATION OF LARGE SCALE INTEGRATION (LSI) TECHNIQUES	87	400	186
	MICOM	- 3427	IMPROVED MANF. TECH. FOR THE MULTI-ENVIRONMENT ACTIVE SEEKER	85	600	191
				86	600	
	MICOM	- 3428	IMPROVED TECHNIQUES FOR COMMON APERTURE MULTISPECTRUM SEEKER	87	259	191

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INSPECTION	AVRADCOM	- 7526	AUTOMATIC IN-PROCESS FAULT ISOLATION FOR DIGITAL HYBRIDS	87	325	114
	AMCCOM	- 8262	PRODUCTION METHODS FOR OPTICAL WAVE GUIDES	84	192	71
				85	421	
ION IMPLANTATION	CECOM	- 3112	WAFER CORRECTION BY ION IMPLANT	86	600	145
	MICOM	- 1090	ION IMPLANTED THIN FILM TRANSISTORS	87	350	195
IPIP	AVRADCOM	- 7426	AIRCRAFT ELECTRONICS MFG PRODUCTIVITY IMPROVEMENT PROGRAM	85	2500	121
				86	1000	
				87	1500	
	CECOM	- 3094	COMMUNICATIONS TECHNOLOGY TECHMOD FOR JTIDS	83	1054	143
				84	1222	
				85	1000	
	CECOM	- 3125	INDUSTRIAL PRODUCTIVITY IMPROVEMENT	87	500	143
	ERADCOM	- 5196	INDUSTRIAL PRODUCTIVITY IMPROVEMENT (ELECTRONICS)	83	893	166
				84	1500	
	MICOM	- 1075	ELECTRONICS COMPUTER AIDED MANUFACTURING (ECAM)	84	1000	184
				85	3300	
				87	3300	
	MICOM	- 1121	MISSILE MANUFACTURING PRODUCTIVITY IMPROVED PROGRAM	85	5000	197
				86	2000	
MACHINING	AMCCOM	- 8467	DIAMOND POINT TURNING OF GLASS OPTICS	86	170	72
				87	185	
	ERADCOM	- 5192	THERMAL WEAPONS SYSTEM (TWS) IR OPTICS - PHASE I	84	165	167
	MICOM	- 3302	ELECTRO DISCHARGE MACHINING PROCEDURE	87	400	198
METALLIZATION	ERADCOM	- 5187	TUNABLE MILLIMETER WAVE INP GUNN SOURCES	85	1150	169
				86	575	
				87	300	
PHOTO-LITHOGRAPHY	ERADCOM	- 5001	SOLID STATE SCAN CONVERTER COPLANAR MICROELECTRONICS	86	710	164
	ERADCOM	- 5109	ULTRAWIDE BANDWIDTH SAW DELAY LINES	83	408	167
	ERADCOM	- 5137	FABRICATION TECHNIQUES FOR HIGH SPEED VHSIC	86	635	164
	ERADCOM	- 5168	AUTOMATIC RETICLE INSPECTION SYSTEM, PHASE I	83	600	164
				84	575	
				85	700	
	ERADCOM	- 5213	PRECISION HIGH-QUALITY VHSIC X-RAY MASKS	85	388	165
	ERADCOM	- 5263	SAW DEVICES WITH SUB-MICRON ELECTRODES	86	75	168
				87	320	
	MICOM	- 1072	MULTIPLE HIGH RELIABILITY/LOW VOLUME LSI MFG	83	1000	195
				84	1200	
	MICOM	- 1102	LITHOGRAPH FOR MICROCIRCUIT CHIPS	87	1250	185
	MICOM	- 1115	IMP MFG PROC/10 MICROMETER DIODES/OPTICAL BEAMRIDER APPL	87	300	183
PLATING	AMCCOM	- 1803	IMPROVED LEAD DIOXIDE ELECTROPLATING TECHNOLOGY	84	346	43
	CECOM	- 3091	LIGHTWEIGHT SURVIVABLE ANTENNA FOR ARMOR VEHICLES	87	575	141
	CECOM	- 3119	ELECTRICAL CONTACT FOR HGCDTE CRYSTALS	86	850	139

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	CECOM	- 3122	IMPROVED PLATING FOR HGCDTE CRYSTALS	87	900	139
	MICOM	- 1031	ELIMINATE GOLD ON PWB CONTACTS AND CABLE PINS	87	620	184
	MICOM	- 1056	MILLIMETER WAVE OSCILLATORS FOR MONOPULSE RECEIVERS	87	500	188
PLATING	MICOM	- 1066	ADDITIVE SINGLE AND MULTILAYER HYBRID CIRCUITRY	85	450	195
				86	450	
				87	185	
	MICOM	- 1091	ELIM OF PRECIOUS METALS MICROCIRCUIT APPLICATIONS	87	2000	196
	MICOM	- 3184	SCREEN PRINTING PROCESSES FOR PTH ON PLASTIC PCB'S	87	350	186
SEALING	MICOM	- 1095	AUTOMATIC SEALING OF HYBRIDS	87	1550	196
	TACOM	- 6077	SEALED LEAD ACID STORAGE BATTERY	84	50	217
				85	150	
				86	150	
				87	125	
SINTERING	ERADCOM	- 5045	THERMOELECTRIC COOLER MATERIALS	86	210	160
	ERADCOM	- 5102	HIGH COERCIVITY, HIGH ENERGY PRODUCT MAGNETS	84	744	162
	AVRADCOM	- 7407	AUTOMATED LASER SOLDERING	87	330	115
	AVRADCOM	- 7525	LASER SOLDERING OF PRINTED WIRING BOARDS	86	185	114
				87	150	
SOLDERING	CECOM	- 3137	LASER SOLDER/INSPECTION SYSTEM FOR PWB	87	800	142
	MICOM	- 1055	REMOVE GOLD FROM COMPONENT LEADS	87	150	184
	MICOM	- 3164	COMPONENT SIDE PRINTED CIRCUIT BOARD SOLDERING	87	350	186
SPUTTERING	CECOM	- 3090	GAINASP LICHT EMITTING DIODES	85	520	144
	ERADCOM	- 5174	AUTOMATIC SPUTTERING PROCESS CONTROL F/PRODUCING ZNO PHASE I	83	150	168
				84	422	
	CECOM	- 3048	MICROPROCESSOR COMPENSATED CRYSTAL OSCILLATOR	85	1150	140
	CECOM	- 3114	HGCDTE IMPURITIES DETERMINATION	86	850	139
	CECOM	- 3123	HIGH THROUGHPUT FOR LIFETIME SCANNING OF HGCDTE	87	1100	140
	CECOM	- 3124	AUTOMATIC OPTICAL MEASUREMENTS	87	1500	144
	CECOM	- 9289	AUTOTEST OF MICROWAVE DEVICE WAFERS (CAM)	83	60	141
				84	390	
TESTING	ERADCOM	- 5107	MILLIMETER WAVE POWER SOURCE COMBINER	83	205	163
				84	974	
	ERADCOM	- 5221	THERMAL WEAPONS SYSTEM (TWS) ADVANCED FOCAL PLANE, PHASE I	86	270	160
	ERADCOM	- 5259	MICRON IC FABRICATION INSPECTION TECHNIQUES	86	90	164
				87	370	
				88	180	
	MICOM	- 1132	SINGLE MODE FIBER FOG LINK	85	375	189
				86	475	
	MICOM	- 1142	PROCESS VALIDATION FOR SEMICONDUCTOR DEVICES	85	300	196
				86	400	
	MICOM	- 3243	ANALOG FAULT ISOLATION OF PRINTED CIRCUIT BOARDS	87	500	201

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VACUUM BAKEOUT	ERADCOM	- 5063	VACUUM DEWARS FOR MOSAIC ARRAYS	85	300	159
				86	430	
	ERADCOM	- 5180	MMT FOR METAL DEWAR AND UNBONDED LEADS	83	1425	160
				84	3075	
VACUUM DISTILLATION	CECOM	- 3101	AUTOMATIC PURIFICATION OF TELLURIUM	85	450	140

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* METALS *
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PROCESS	COMMAND	EFFORT	EFFORT TITLE	FY	COST	PAGE
	AMCCOM	- 8474	APPL OF PARTIAL REFRACTORY LINERS TO CANNON TUBES	84	389	92
				85	290	
ASSEMBLY	AMCCOM	- 8607	AUTOMATED FLUSHING OF RECOIL SYSTEMS TO REDUCE CONTAMINATION	86	150	89
	AMCCOM	- 8703	AUTOMATED RECOIL MECHANISM ASSEMBLY	87	150	89
	TACOM	- 4004	AUTOMATED DISASSEMBLY OF DOUBLE PIN TRACK	82	299	154
				83	341	
				84	260	
	AMCCOM	- 3712	PRODUCTION BASE FOR NOVEL SHAPED CHARGE LINERS	86	250	
				87	500	
	AMCCOM	- 8231	IMPROVED CASTING TECHNOLOGY (CAM)	83	136	77
				84	121	
	AMCCOM	- 8251	IMPROVED MELTING AND POURING TECHNOLOGY	83	164	88
	AMCCOM	- 8435	SQUEEZE CASTING OF CANNON COMPONENTS	86	220	87
	AMCCOM	- 8437	DENSIFICATION OF WEAPON CASTINGS (HIP)	84	195	87
	AMCCOM	- 8440	PRECISION CAST BREECH BLOCKS	86	335	85
	AMCCOM	- 8511	CASTING OF ANTIFRICTION METAL COMPONENTS	85	220	89
				86	70	
	AMCCOM	- 8513	MICROWAVE CURING OF FURAN BONDED SAND	86	95	79
	AMCCOM	- 8608	STATE-OF-THE-ART LADLE/FURNACE REFINING	86	85	73
	AMCCOM	- 8612	ELECTROSLAG REMELTING FOR WEAPON COMPONENTS	86	75	89
				87	60	
CASTING	AMCCOM	- 8706	INVESTMENT CASTING OF LARGE WEAPON COMPONENTS	87	105	83
	AMCCOM	- 8709	NEAR NET SHAPE MOLDING	87	140	83
	AVRADCOM	- 7191	COST EFFECTIVE PRODUCTION OF COOLED TURBINE ROTORS	87	440	132
	AVRADCOM	- 7300	IMPROVED LOW CYCLE FATIGUE CAST ROTORS	84	350	132
	AVRADCOM	- 7362	ENG DESIGN HANDBOOK FOR TITANIUM CASTINGS	84	150	120
	AVRADCOM	- 7401	CAST IMPELLER AND CLEAN CASTING	87	685	132
	AVRADCOM	- 7402	CAST INTEGRAL LOW PRESS TURBINE ROTOR	87	650	132
	AVRADCOM	- 7409	IMPROVED CAST TURBINE ROTOR	87	330	133
	AVRADCOM	- 7416	ADVANCED TURBINE AIRFOIL CASTINGS	84	400	130
				85	500	
				86	200	
	AVRADCOM	- 7458	CAST T-700 TURBINE CASE	86	293	128
				87	339	
	AVRADCOM	- 7481	MMT FOR CLEAN CASTINGS - ROTATING COMPONENTS	85	200	126
				86	150	
	TACOM	- 6085	IMPROVED CASTING PROCESSES	87	600	215
	AMCCOM	- 2742	LASER APPLIED DURABLE COATINGS	86	150	44
				87	200	
COATING	AMCCOM	- 8230	NON SOLVENT BASED PAINTING PROCESSES	87	125	77
	AMCCOM	- 8523	SPRAY-AND-FUSE PROCESSING OF ARMAMENT COMPONENTS	84	215	86
				85	181	
	AMCCOM	- 8326	APPLICATION OF CORROSION RESISTANT GALVANIC COATINGS	84	200	86

PROCESS	COMMAND	EFFORT	EFFORT TITLE	FY	COST	PAGE
COATING	AMCCOM	- 8360	ESTABLISHMENT OF ZINC ION VAPOR DEPOSITION PROCESS	86	90	77
	AMCCOM	- 8473	APPL FUSED SALT PROCESS TO COAT TANTALUM ON L CAL LINERS	86	95	92
				87	185	
	AMCCOM	- 8524	REFRACTORY METAL COATING FOR GUN TUBES	86	120	97
				87	170	
	AMCCOM	- 8533	TECHNOLOGY FOR ERROSION RESISTANT COATING FOR GUN BARRELS	86	115	97
				87	135	
	AMCCOM	- 8711	CERAMIC GUN TUBE PROCESSING	87	240	93
				88	505	
	AVRADCOM	- 7475	ONE PART SEALANT FOR WATER INTEGRITY	87	250	108
CUTTING	AMCCOM	- 2726	LASER CUTTING SLOTS IN HARDENED STEEL STRUCTURES	87	190	51
				86	250	
	AMCCOM	- 2731	ULTRASONIC ASSISTED MACHINING	86	350	51
	AMCCOM	- 8354	CUTTING OF HOT ROTARY FORGED TUBES	83	414	91
	AMCCOM	- 8442	IMPROVED CUTTING OF CHARPY AND TENSILE BLANKS	84	80	92
	AMCCOM	- 8705	LASER REMOVAL OF GATES AND RISERS FROM CASTINGS	87	440	83
	AVRADCOM	- 7244	LASER CUTTING AND WELDING OF METAL	87	330	109
	TACOM	- 5091	HEAVY ALUMINUM PLATE FABRICATION	87	280	215
				86	300	
DRAWING	AMCCOM	- 4542	ULTRASONIC DEEP DRAWING OF CANNON STEEL CARTRIDGE CASES	86	338	51
				87	232	
EXTRUSION	AMCCOM	- 8536	MOLYBDENUM ALLOY GUN BARREL LINERS	86	310	98
	MERADCOM	- 3803	ACCESS/EGRESS MAT PANELS	85	580	207
				86	250	
FIXTURING	TACOM	- 6118	FLEXIBLE FIXTURING SYSTEMS	87	200	220
FORGING	AMCCOM	- 4401	HOT FORMING AND COLD HEADING LARGE FUZE COMPONENTS	87	321	43
	AMCCOM	- 7615	AUTOMATED FORGING OF WEAPON COMPONENTS (CAM RELATED)	87	270	72
	AMCCOM	- 8153	INCREASING GUN TUBE HEAT TREATMENT CAPACITY	84	250	90
	AMCCOM	- 8402	WARM FORGING OF WEAPON COMPONENTS (CAM)	84	227	78
				85	227	
	AMCCOM	- 8471	MFG OF SC WPNS COMPONENTS BY THIXO FORGING	86	135	98
				87	210	
	AMCCOM	- 8670	PROCESS CONTROL IMPROVEMENT IN SMALL CAL WEAPON FAB	86	120	99
	AVRADCOM	- 7267	LOW COST GEARS FOR TURBINE ENGINES AND ACC GEARBOX	87	415	117
	AVRADCOM	- 7434	INJECTION FORGING OF TITANIUM IMPELLERS	86	235	127
				87	265	
	AVRADCOM	- 7455	HIGH HOT HARDNESS GEAR STEEL PROCESSING REFINEMENT	87	200	118
	AVRADCOM	- 7457	APPLICATION OF FINE GRAINED PREFORMS	85	400	127
				86	500	
	AVRADCOM	- 7469	NEAR NET SHAPE FORGED SPIRAL BEVEL GEARS	85	695	118
				86	805	
				87	639	

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	AVRADCOM	- 7485	AXIAL COMPRESSOR ROTORS BY ISOTHERMAL FORGING	85	400	127
				86	400	
				87	200	
FORGING	AVRADCOM	- 7502	ISOSTATIC FORGING FOR AH-64 SHOCK STRUT	87	200	108
	TACOM	- 6092	AUSROLLED GEARS FOR TACTICAL VEHICLES	85	350	219
	AMCCOM	- 4529	MFG OF TWO-PIECE NOSE FOR HEAT PROJECTILE	83	447	52
				84	675	
	AMCCOM	- 4583	IMPROVED PROCESS FOR CAL .50 CORE MANUFACTURE	86	580	53
	AMCCOM	- 4585	SABOT LAUNCHED ARMOR PENETRATOR (SLAP) AMMO MFG PROCESSES	86	1055	65
				87	350	
	AMCCOM	- 4597	MFG PROC F/CANNON CALIBER DU PENETRATOR (20MM, 25MM, 30MM)	84	374	53
				85	450	
	AMCCOM	- 8422	HONE FORMING OF RECOIL CYCLINDERS	86	95	88
				87	345	
FORMING	AMCCOM	- 8621	SPRAY FORMING FOR TUBE MANUFACTURE	86	285	93
	AVRADCOM	- 7373	SAND PUNCH SPF OF TITANIUM	87	300	111
	AVRADCOM	- 7377	SPF/DB STATIC STRUCTURE FOR TURBINE ENGINES	85	475	126
				86	675	
	AVRADCOM	- 7389	SUPERPLASTIC FORMING OF ALUMINIUM COMPONENTS	83	125	111
				84	745	
	AVRADCOM	- 7492	COLD FORM TITANIUM EROSION CAPS FOR ROTOR BLADE	86	200	124
				87	150	
	AVRADCOM	- 7501	IMPROVED LOW COST SPF TITANIUM STRUCTURES	86	375	113
				87	275	
	MICOM	- 1135	LOW COST HEMISPHERICAL SHAPED CHARGES	85	2900	185
				86	3950	
				87	750	
	AMCCOM	- 7945	HEAT RECOVERY FROM MANUFACTURING PROCESSES	86	40	75
				87	130	
	AMCCOM	- 7985	SMALL ARMS WEAPONS NEW PROCESS PRODUCTION TECHNOLOGY	85	900	97
	AMCCOM	- 8535	DETERMINATION OF AREAS WITHIN MANTECH FOR FUTURE R+D	86	40	76
	AMCCOM	- 8671	INCLUSION CONTROL TECHNOLOGY APPLIED TO RAPID FIRE WEAPONS	86	150	83
				87	170	
				88	350	
GENERAL	AMMRC	- 6390	PROGRAM IMPLEMENTATION AND INFORMATION TRANSFER	83	250	176
				84	250	
				85	250	
				86	250	
				87	250	
	AVRADCOM	- 7001	MFG TECHNOLOGY FOR AIRFRAME AND SECONDARY STRUCT	87	100	107
	AVRADCOM	- 7002	MFG TECHNOLOGY FOR HI-PERFORMANCE ENGINES AND COMPONENTS	87	100	127
	AVRADCOM	- 7003	MANUFACTURING TECHNOLOGY FOR DRIVE PARTS AND COMP	87	100	116
	AVRADCOM	- 7436	HIGH PERFORMANCE METAL MATRIX COMPOSITE STRINGER FORMS	87	250	112

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GENERAL	MICOM	- 1036	PRODUCTION METHODS FOR VSTT TURBINE ROTORS	87	400	198
	AMCCOM	- 8225	ELECTROCHEMICAL GRINDING OF WEAPON COMPONENTS	84	138	77
	AMCCOM	- 8250	IMPROVED FABRICATION OF RECOIL WEAR SURFACES	84	28	88
				85	269	
GRINDING	AMCCOM	- 8515	APPLICATION OF WIDE AREA PLUNGE GRINDING	86	40	80
				87	105	
	AMCCOM	- 8543	SLIDE TABLE CLIMB CREEP FEED GRINDING	85	78	85
				87	780	
	AMCCOM	- 8249	SHORT-CYCLE HEAT TREATING OF WEAPON COMPONENTS	84	132	86
				85	165	
	AMCCOM	- 8307	CRYOGENIC TREATMENT OF TOOL STEELS	86	50	84
	AMCCOM	- 8406	AUSTENITIZING AND HOMOGENIZING PROCEDURES FOR ARMOR CASTINGS	84	136	78
	AMCCOM	- 8426	APPLICATION OF LASERS TO CANNON MANUFACTURE	84	750	86
HEAT	AMCCOM	- 8433	IN PROCESS CONTROL OF SELAS HEAT TREAT SYSTEM (CAM)	84	125	91
TREATMENT	AMCCOM	- 8534	CONSERVATION OF ENERGY IN PROCESSING OF WEAPONS COMPONENTS	86	105	80
				87	140	
	AMCCOM	- 8610	PREPARATION OF COUPONS REPRESENTATIVE OF CASTINGS	86	75	82
				87	70	
	AMCCOM	- 8707	INDUCTION HEATING FOR FORGING/HEAT TREATING	87	150	74
	AMCCOM	- 8708	NEW FURNACE ATMOSPHERES FOR HEAT TREATING	87	95	74
	AVRADCOM	- 7472	SURFACE HARDENING GEARS BY LASER	84	250	118
				85	450	
	TACOM	- 4006	BRADLEY FVS IPI PROGRAM	84	3000	220
				85	4000	
				86	2000	
	TACOM	- 6057	M-1 COMBAT VEHICLE-MFG TECHNOLOGY	83	1085	214
				84	3057	
				85	1750	
				86	950	
				87	375	
IPIP	TACOM	- 6059	FVS COMBAT VEHICLE-MFG TECHNOLOGY	83	1500	214
				84	901	
				85	931	
				86	1500	
				87	3000	
	TACOM	- 6079	AGT-1500 ENGINE	87	1125	218
				85	1120	
				86	1800	
	TACOM	- 6095	ABRAMS TRANSMISSION PRODUCTIVITY IMPROVEMENTS	83	176	221
				84	300	
				85	1145	
				86	800	
	TSARCOM	- 8192	TURBINE ENGINE PRODUCTIVITY IMPROVEMENT	84	1000	235

PROCESS	COMMAND	EFFORT	EFFORT TITLE	FY	COST	PAGE
IPIP	TSARCOM	- 8198	T-700 TURBINE ENGINE MFG PRODUCTIVITY IMPROVEMENT	85	2000	235
				86	1000	
				87	1400	
JOINING	AVRADCOM	- 7396	INTEGRAL LOW COST FASTENING SYSTEMS FOR RPV	87	175	109
	AVRADCOM	- 7480	DUAL PROPERTY COMPRESSOR IMPELLER	85	400	133
				86	500	
				87	300	
				84	160	
MACHINING	AMCCOM	- 2736	CHEMICAL MACHINING OF PRECISION COMPONENTS	86	120	43
				87	250	
	AMCCOM	- 3703	WASP SHAPED CHARGE LINER	86	400	51
				87	500	
	AMCCOM	- 4519	OUTLINE AUTOMATIC DETECTION OF TOOL WEAR	86	40	52
	AMCCOM	- 8103	HIGH VELOCITY MACHINING	83	285	89
				86	40	
	AMCCOM	- 8206	APPLICATION OF HIGH-RATE ABRASIVE MACHINING	86	40	76
				87	105	
	AMCCOM	- 8351	IMP MFG OF QUADRANT FLATS + MUZZLE BRAKE	83	88	90
				85	350	
				87	30	
	AMCCOM	- 8441	IMPROVED MANUFACTURE OF PRIMER CHAMBERS	84	80	85
				86	170	
	AMCCOM	- 8444	MACHINING INTERNAL SURFACES OF MUZZLE BRAKES	86	135	87
	AMCCOM	- 8449	OPTIMAL RIFLING CONFIGURATION FOR CHROME PLATING	84	228	92
				85	180	
	AMCCOM	- 8500	NON-TOXIC COOLANT FOR HIGH SPEED MACHINING	87	100	94
	AMCCOM	- 8506	ADVANCED MACHINING METHODS FOR COST DRIVER PARTS	86	140	79
	AMCCOM	- 8516	COMPOUNDING OF CUTTING FLUIDS + OILS FOR PRODUCTION	85	144	68
	AMCCOM	- 8542	DIAMOND APPLICATION IN CANNON MFG	86	50	87
				87	60	
	AMCCOM	- 8544	WIRE E.D.M. MACHINING OF RIFLING BROACHES	86	35	92
				87	195	
	AMCCOM	- 8546	MACHINERY CONDITIONS SURVEILLANCE SYSTEM	85	350	87
	AMCCOM	- 8550	BALANCED TOOL MACHINING	86	25	93
				87	70	
	AMCCOM	- 8627	ELECTROCHEMICAL MACHINING OF METERING GROOVES	86	75	82
	AMCCOM	- 8710	AUTOMATED CONTROL OF CUTTING FLUID CONCENTRATION LEVEL	87	200	84
	AVRADCOM	- 7324	FREEWHEEL SPRING CLUTCH MANUFACTURING PROCESS	87	250	118
	AVRADCOM	- 7471	PROCESS CONTROL SYSTEM FOR N/C AND CNC MACHINES	84	160	130
				85	340	
	AVRADCOM	- 7508	BALLISTIC TOLERANT HELICOPTER BEARINGS	86	150	116
				87	100	
	AVRADCOM	- 7510	PRODUCTIONIZED FABRICATION OF OVERRUNNING CLUTCH SPRING	86	200	119

PROCESS	COMMAND	EFFORT	EFFORT TITLE	FY	COST	PAGE
MACHINING	DESCOM	- 7004	AUTOMATED ENGINE BLOCK MACHINING	85	730	152
				86	240	
	TACOM	- 5090	IMPROVED AND COST EFFECTIVE MACHINING TECHNOLOGY	83	350	219
	TACOM	- 5093	HIGH SPEED MACHINING OF ALUMINUM TCV COMPONENTS	87	550	219
				86	500	
	TACOM	- 6008	AUTOMATED COMPUTER CONTROL LASER MACHINING	86	350	217
				87	550	
METAL REMOVAL	AMCCOM	- 8439	IMPROVED RIFLING PROCEDURES	84	80	91
	AVRADCOM	- 7248	CLOSED LOOP MACHINING, MID-FRAME	87	540	127
	AVRADCOM	- 7366	SPIRAL SELF-ACTING SEAL	84	400	129
				85	300	
PLATING	AMCCOM	- 8245	LOW CONTRACTION (LC) CHROMIUM PLATING	83	195	90
	AMCCOM	- 8555	POLLUTION CONTROL THRU ZERO DISCHARGE	85	200	94
				86	95	
	AMCCOM	- 8611	AUTOMATED ANALYSIS AND CONTROL OF PLATING BATHS	86	55	82
				87	150	
	AMCCOM	- 8626	INCREASED DEPOSITION RATES FOR HARD CHROME PLATING	86	75	82
	AMCCOM	- 8712	DISPOSITION OF SPENT CHROMIC ACID PLATING SOLUTION	87	100	84
POWDER METALLURGY	AMCCOM	- S021	HOT FORMING OF P/M PROJ BODIES	86	170	64
				87	127	
	AMCCOM	- 3209	POWDERED METAL (PM) FOR LOW DRAG 20-40MM PROJECTILES	86	475	53
				87	327	
	AMCCOM	- 8102	APPLIC. OF POWDER METALLURGY FORGINGS TO COMP.	83	142	85
	AMCCOM	- 8324	PROCESS CONTROLS FOR P/M WEAPON COMPONENTS	83	161	98
				84	199	
				85	593	
	AMCCOM	- 8530	LIGHTWEIGHT P/M WEAPON COMPONENTS	86	115	99
				87	155	
	AMCCOM	- 8609	HIP-ING OF LARGE POWDERED METAL COMPONENTS	86	60	81
				87	80	
	AMCCOM	- 8613	POWDERED METALS FOR NONFERROUS COMPONENTS	86	45	82
				87	60	
	AMCCOM	- 8662	FABRICATION OF PM WEAPON COMPONENTS	86	75	99
				87	170	
	AVRADCOM	- 7187	POWDER MET GEARS FOR GAS TURBINE ENGINES	84	400	116
				85	550	
				86	250	
	AVRADCOM	- 7334	ESTABLISH MANTECH FOR POWDER PROC ROLLING BEARINGS	87	300	116
	AVRADCOM	- 7363	POWDER PROCESSED NET SHAPE TOOL STEEL ROLLING BEARINGS	86	300	129
				87	400	
	AVRADCOM	- 7411	SECOND GENERATION DUAL PROPERTY TURBINE ROTORS	87	350	133
	AVRADCOM	- 7413	COOLED RADIAL TURBINE MFG PROCESS	87	300	133

PROCESS	COMMAND	EFFORT	EFFORT TITLE	FY	COST	PAGE
POWDER METALLURGY	AVRADCOM	- 7417	LOW COST DISKS BY CAP	84	300	131
				85	450	
				86	300	
	AVRADCOM	- 7435	IRON BASE ALLOYS BY A RAPID SOLIDIFICATION PROCESS	85	500	128
				86	800	
	AVRADCOM	- 7453	CERAMIC-FREE ATOMIZATION OF SUPERALLOY POWDER	85	500	131
				86	550	
	AVRADCOM	- 7500	POWDERED METAL PARTS	86	275	109
				87	350	
	AVRADCOM	- 7509	POWDERED METAL GEAR STEELS	86	400	118
				87	300	
	TACOM	- 4513	HIGH DENSITY POWDER METAL PARTS FOR COMBAT VEHICLES	87	550	223
PROCESS SELECTION	AMCCOM	- 4397	FABRICATION OF ADVANCED WARHEADS	87	350	52
				86	750	
	AMCCOM	- 4563	XM803 METAL PARTS PRODUCTIVITY	83	2625	53
				84	3088	
				85	1322	
	AMCCOM	- 4581	PRODUCTION MFG TECH FOR SFF WARHEAD LINER	84	383	53
				85	526	
	AMCCOM	- 8526	PROCESSING OF HIGH STRENGTH/LIGHT WEIGHT WEAPONS COMPONENTS	87	145	99
	MERADCOM	- 3801	FREE PISTON STIRLING ENGINE GENERATOR SET	86	550	208
				87	900	
	MICOM	- 1086	COBALT REPLACEMENT IN MARAGING STEEL F/ROCKET MOTOR COMP	83	500	199
				81	300	
	TACOM	- 5074	PRODUCTION TECHNIQUES FOR COMBAT VEHICLE SUSPENSION SYSTEMS	87	1250	221
	TACOM	- 6403	ADVANCED CERAMIC/COMPOSITE ARMOR	86	1150	215
				87	1300	
ROLLING	AMCCOM	- 8605	RING ROLLING OF WEAPON COMPONENTS	86	70	81
	TACOM	- 5094	ALLOY AND ARMOR STEELS TREATED WITH RARE EARTH ADDITIVES	85	600	214
SKIVING	AMCCOM	- 8352	SKIVING OF GUN TUBE BORES	83	120	91
				85	575	
SURFACE TREATMENT	AMCCOM	- 8339	APPLIC OF NON-TRADITIONAL SURF. HARDENING METHODS	86	150	85
	AMCCOM	- 8502	ION IMPLANTATION OF WEAR SURFACES	87	65	78
				88	150	
	AMCCOM	- 8522	LASER SURFACE ALLOYING PROCESS FOR IMPROVED WEAR RESISTANCE	86	115	80
				87	170	
	AMCCOM	- 8523	ION IMPLANTATION OF WEAPON COMPONENTS	86	145	80
				87	245	
	AMCCOM	- 8552	ELECTROPOLISHING TO IMPROVE TUBE FATIGUE LIFE	86	55	93
	AMCCOM	- 8602	LASER SURFACE HARDENING	86	50	80
				87	430	
	AMCCOM	- 8606	IMPROVED CARBURIZING TECHNOLOGY	86	70	81
	AMCCOM	- 8713	INDUCTION HARDENING BY THE SCANNING PROCESS	87	75	84

PROCESS	COMMAND	EFFORT	EFFORT TITLE	FY	COST	PAGE
SURFACE TREATMENT	AVRADCOM	- 7155	COST EFFECTIVE MFG METHODS FOR HELICOPTER GEARS	84	325	116
				85	175	
	AVRADCOM	- 7298	EVALUATION OF HIGH TEMPERATURE CARBURIZING	83	380	117
				84	400	
	AVRADCOM	- 7394	DOUBLE HELICAL GEAR	87	330	117
	AVRADCOM	- 7399	CARPENTER EX-00053 GEAR STEEL	87	150	117
	AVRADCOM	- 7405	PLASMA NITRIDING OF HELICOPTER GEARS	87	350	117
	AVRADCOM	- 7437	PRODUCTION OF CRITICAL HELICOPTER PARTS BY ION NITRIDING	86	250	129
				87	300	
	TACOM	- 4514	HARD FACING OF TRACK SHOES	86	150	223
				87	200	
WELDING	AMCCOM	- 3707	WELDING TECHNOLOGY ADVANCEMENTS (AF83-7)	86	300	54
				87	200	
	AMCCOM	- 7417	LASER WELDING TECHNOLOGY FOR WEAPON COMPONENTS	87	100	72
				88	1250	
	AMCCOM	- 8430	AUTOMATED WELDING OF ROTARY FORGE HAMMERS	84	137	91
	AMCCOM	- 8431	AUTOMATED WELDING OF BORE EVACUATORS	84	215	91
	AMCCOM	- 8501	NON-ROTATION METHODS OF FRICTION WELDING	87	225	73
				88	130	
	AMCCOM	- 8503	ELECTRO-MECHANICAL JOINING TECHNIQUES	86	90	78
				87	50	
	AVRADCOM	- 7326	ADAPT OF ELECTRON BEAM WELDING FOR REPAIR SHAFTS	87	200	119
	AVRADCOM	- 7378	STAINLESS STEEL FABRICATED HOUSING	84	400	120
				85	900	
				86	600	
	AVRADCOM	- 7408	MONO-ROTOR FAB FOR APU APPLICATIONS	87	220	132
	TACOM	- 4577	ATTACHMENT OF COMBINATION ARMOR TO COMBAT VEHICLES	85	1250	214
				86	2000	
				87	1500	
	TACOM	- 4579	INDUSTRIAL PRACTICES FOR WELDING CONSTRUCTIONAL ALLOY STEELS	87	300	217
	TACOM	- 5088	HIGH-POWER ELECTRON BEAM WELDING IN AIR	87	350	214
				86	350	
	TACOM	- 6038	HIGH DEPOSITION WELDING PROCESSES FOR ARMOR	85	500	214
				86	115	
	TACOM	- 6053	WELDING SYSTEMS INTEGRATION	86	500	215
				87	1000	
	TACOM	- 6099	MANUFACTURING METHODS FOR SPECIALIZED ARMOR MATERIALS	86	4000	218
				87	4800	
	TACOM	- 6125	WELD PROCESS PLANNING AND CONTROL	85	500	215
				86	550	

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* MUNITIONS *
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PROCESS	COMMAND	EFFORT	EFFORT TITLE	FY	COST	PAGE
	AMCCOM	- C010	PERSONAL EQUIPMENT DECON SYSTEM	87	500	31
				88	600	
	AMCCOM	- C011	IMPROVED CHEMICAL BIOLOGICAL DECONTAMINANT	86	1138	31
	AMCCOM	- C012	MULTI-PURPOSE CHEMICAL-BIOLOGICAL DECONTAMINANT	86	500	32
				87	500	
	AMCCOM	- C014	MFG TECH FOR NBC GROUND RECON VEHICLE III	86	500	32
				87	1500	
	AMCCOM	- 0927	COMPUTER-AIDED PROCESS PLANNING FOR CB FILTERS	85	200	34
				86	150	
	AMCCOM	- 1714	AUTO QUALITY CONTROL FOR MANUFACTURE OF PYRO MUNITIONS	85	350	36
				86	325	
	AMCCOM	- 4198	AUTOMATED LAP OF STICK PROPELLANT CHARGES	84	1007	44
ASSEMBLY	AMCCOM	- 4251	AUTO MANU OF DELAY FOR M549 AND XM650 PROJECTILES	87	968	46
	AMCCOM	- 4534	MODERNIZED PROCESSES FOR MANUFACTURE OF NATO 5.56MM AMMO	83	812	64
				84	1723	
	AMCCOM	- 4538	5.56MM SAWS LINK ORIENTOR AND FEED SYSTEM	83	398	64
	AMCCOM	- 4550	AUTO ASSY OF M22 FLASH SIMULATOR	84	465	46
				85	840	
	AMCCOM	- 4595	*AUTOMATED ASSEMBLY OF M21 FLASH SIMULATOR*	85	550	45
				86	870	
	AMCCOM	- 4606	AUTOMATED ASSEMBLY OF BLU 97/B COMBINED EFFECTS MUNITION	84	1418	45
	AMCCOM	- 4642	CAL .50 CARTRIDGE FEEDING	85	360	65
	AMCCOM	- 4643	AUTO LINKING OF CAL .50 AMMUNITION	85	400	65
	AMCCOM	- 0928	PROC TECH FOR VEHICLE ENGINE EXHAUST SYSTEM	85	400	31
				86	275	
	AMCCOM	- 1709	IMPR PROCESSING OF STARTER MIX FOR PYROTECHNIC MUNITIONS	83	446	36
	AMCCOM	- 1914	PROCESS ENGINEERING FOR (EAK) EXPLOSIVE	85	700	40
	AMCCOM	- 4273	AUTO PRODUCTION OF STICK PROPELLANT	84	1028	57
				85	612	
BLENDING	AMCCOM	- 4531	AUTOMATED PRODUCTION OF MULTI-BASE STICK PROPELLANT ON CAMBL	85	898	57
				86	670	
				87	893	
	AMCCOM	- 4547	PROCESS TECHNOLOGY FOR IR XM76 GRENADE	83	319	35
				84	301	
	AMCCOM	- 4548	SAFETY IMPROVEMENTS OF PYROTECHNIC MIXING	83	1197	36
				84	454	
	AMCCOM	- 4572	IMPROVED BATCH PROCESSING OF MULTI BASE PROPELLANTS	85	427	58
				86	980	
				87	876	
	AMCCOM	- 4573	COMBINED CPD, MIX AND EXTRUSION FOR S.B. PROPS	85	441	59
				86	1513	
				87	1478	
	AMCCOM	- 4615	IMPROVED SOLVENTLESS PASTE BLENDING	85	953	57

PROCESS	COMMAND	EFFORT	EFFORT TITLE	FY	COST	PAGE
	AMCCOM	- 4660	AUTOMATED BLENDING OF STICK PROPELLANT	85	723	51
				86	1875	
				87	1465	
BLENDING	MICOM	- 1038	PRODUCTION OF NITRO POLYMERS FOR SMOKELESS PROPELLANTS	87	650	200
	MICOM	- 1044	CONTINUOUS PROCESS FOR PROPELLANT MANUFACTURE	87	1477	200
	MICOM	- 3450	SCALE UP + DEMONSTRATION OF A PROCESS FOR DIBORANE	87	950	201
	NAVSEA	- 1913	PBX CONT CAST FOR BOMB LOADING	85	500	40
				86	1250	
				87	1000	
CHLORINATION	AMCCOM	- 1348	SUPER TROPICAL BLEACH	83	340	35
				84	264	
COATING	AMCCOM	- 0920	MFG TECH, AUTOMATIC LIQUID AGENT DETECTOR	84	197	33
				85	773	
				86	412	
	AMCCOM	- 4540	CALCIUM CARBONATE COATING OF 7.62MM BALL PROPELLANTS	83	115	56
				84	322	
CRYSTALIZATION	AMCCOM	- 4566	RDX/HMX RECRYSTALLIZATION PARTICLE SIZE CONTROL	84	531	40
	AMCCOM	- 4578	MODIFICATION + IMPROVEMENT OF DMSO PILOT PROCESS FOR RDX/HMX	84	588	39
				85	454	
				86	1200	
	AMCCOM	- 4027	SOLVENT RECOVERY/DRYING OF SINGLE BASE PROPELLANTS	86	513	38
				87	569	
DRYING	AMCCOM	- 4145	CONTROL DRYING IN AUTO SB AND BALL PROP MFG	84	195	56
	AMCCOM	- 4449	PROCESS IMPROVEMENT FOR COMPOSITION C-4	81	339	39
				83	520	
	AMCCOM	- 4605	PROPELLANT BED DEPTH CONTROL IN CASBL AIR DRY	83	579	59
	AMCCOM	- 2716	USE OF HEAT FROM NITRIC ACID RECOVERY	86	430	37
	AMCCOM	- 2717	USE OF HEAT DISSIPATED IN ACID STEAM CONDENSER	86	395	37
	AMCCOM	- 2718	UTILIZATION OF HEAT GENERATED IN TNT MANUFACTURE	86	470	37
				87	285	
ENERGY	AMCCOM	- 2720	USE OF HEAT FROM SULFURIC ACID RECOVERY	86	745	37
CONSERVATION	AMCCOM	- 2722	HEAT RECOVERY FROM CYCLOHEXANONE VAPOR	86	405	37
	AMCCOM	- 3714	ALTERNATIVE AZEOTROPIC SOLVENT FOR ACETIC ACID CONCENTRATION	86	335	38
				87	285	
	AMCCOM	- 4281	CONSERVATION OF ENERGY AT AAPS	84	270	38
				85	478	
				86	800	
				87	1200	
EXTRACTION	AMCCOM	- 4533	LOVA PROPELLANT PROCESSING	83	398	57
EXTRUSION	AMCCOM	- 4656	NITRAMINE PROPELLANT PROCESSING	85	594	58
	MICOM	- 1027	LOW COST SMALL ROCKET CONTAINER/LAUNCHER PODS	87	338	183
GENERAL	AMCCOM	- 3713	EQUIP IDENT + ASSESSMENT TO MAINTAIN A RESPONSIVE PDN BASE	86	500	51
				87	750	

PROCESS	COMMAND	EFFORT	EFFORT TITLE	FY	COST	PAGE
GENERAL	AMCCOM	3721	MFG PROCESS F/LAP OF IMPROVED MINE SYSTEM	86	500	48
				87	750	
	AMCCOM	3722	MFG PROCESSES F/LAP OF OFF-ROUTE ANTITANK MINE SYSTEM	86	700	48
				87	1500	
	AMCCOM	3723	MFG PROCESS F/LAP OF THE GUIDED ANTIARMOR MORTAR PROJECTILE	86	1000	48
				87	1500	
	AMCCOM	3725	MFG PROCESSES F/LAP OF ADVANCED CONCEPT MINE SYSTEMS	87	1500	48
	AMCCOM	3726	MMT FOR LAP OF MINIATURE TORCH	86	350	36
	AMCCOM	3727	MFG PROCESSES FOR VARIABLE TIME FIRING DEVICES	87	250	44
	AMCCOM	3728	MFG PROCESSES F/WIDE AREA SPRAY SYSTEM (SPRAY FAE)	86	350	48
				87	750	
	AMCCOM	3729	MFG PROCESSES F/SPEC CONCRETE STRUCTURE DEMOLITION CHARGES	86	250	41
				87	200	
	AMCCOM	3730	MFG PROCESSES F/SENSOR OFF-ROUTE MINE SYSTEM (STORMS)	86	500	44
				87	750	
	AMCCOM	3731	MFG PROCESSES F/XM742 AND XM762 ELECTRICAL TIMER	86	1000	42
				87	1000	
	AMCCOM	3732	MFG PROCESSES F/MULTI-OPTION FUZES	87	1500	42
	AMCCOM	3733	MFG PROCESSES F/ADV DET DESIGNS	86	250	48
				87	850	
	AMCCOM	3734	MFG PROCESSES F/SPEED, SAFE PREEMPLOYED EXPLOSIVE DEVICE	87	500	41
	AMCCOM	3735	MFG PROCESS F/WALL BREAKING CHARGE	86	250	48
				87	250	
	AMCCOM	3736	MFG PROCESSES F/SMART TARGET FIRE AND FORGET PROJ (STAFF)	86	500	52
				87	750	
	AMCCOM	3738	MFG F/GUN FIRED AIR DEFENSE TOM	87	500	52
	AMCCOM	3739	MFG PROCESS F/A FAMILY OF SUBCALIBER SADARM SYSTEMS	87	1000	52
	AMCCOM	3740	MFG PROCESSES F/IMPROVED STANDOFF DUAL PURPOSE TOM	87	1000	52
	AMCCOM	3741	MFG PROCESSES F/ADV DESIGN ARTILLERY TRAINING AMMUNITION	87	1000	52
	AMCCOM	3742	MFG PROCESSES F/MILLIMETER WAVE TECH FUZES/SEEKER SYSTEMS	86	1500	42
				87	1500	
	AMCCOM	3743	MFG PROCESSES F/ADV MICROCOMPUTER APPLIC IN FUZING/SEEKERS	87	1000	42
	AMCCOM	3744	IMPROVED OPTICS MFG PROCESS F/ADVANCED SEEKER SYSTEMS	87	1000	43
	AMCCOM	3745	IMPRVD TECH F/MFG OF 8 IN FIN STABILIZED ART PROJ (CHAMP)	86	500	53
				87	1000	
	AMCCOM	3746	TECHNOLOGY F/LAP OF DIRECT SUPPORT WEAPON SYS (DSWS) AMMO	87	1000	48
	AMCCOM	3747	TECHNOLOGY F/MFG OF ADVANCED 75MM AMMUNITION	86	1000	53
				87	1000	
	AMCCOM	3748	ADVANCED MFG PROCESSES F/IMPROVED SENSORY MUNITIONS (ISM)	87	1000	44
	AMCCOM	4491	TECHNOLOGY DATA BASE FOR PINACOLYL ALCOHOL	85	640	35
				86	1874	
				87	355	

PROCESS	COMMAND	EFFORT	EFFORT TITLE	FY	COST	PAGE
GENERAL	AMCCOM	- 4610	GRANULATION PROCESS FOR EXPLOSIVES	85	647	38
				86	753	
GRINDING	AMCCOM	- 4574	IMPROVED PROCESS FOR RDX/HMX FINES MANUFACTURE	84	526	39
				85	620	
				86	404	
IMPREGNATION	AMCCOM	- 0905	MANUFACTURE OF IMPREGNATED CHARCOAL (WHETLERITE)	84	500	34
				85	260	
LOADING	AMCCOM	- D001	60MM SMOKE PDN TECH F/IMPROVED SMOKE MUNITION	86	460	47
				87	450	
	AMCCOM	- L308	PRESS/INJECTION LOADING OF INSENSITIVE HE	86	200	47
	AMCCOM	- 1712	FILL AND PRESS TECHNOLOGY F/M8 RP GRENADE	85	340	47
	AMCCOM	- 2703	THREAD CLEANING/INSPECTION OF HE LOADED MUNITIONS	86	240	46
				87	150	
	AMCCOM	- 2707	IMPROVED PROCESS FOR HE CAVITY FORMING	86	650	48
	AMCCOM	- 3706	MFG/LDG TECH F/NORWEGIAN BASED PROJECTILES	86	700	48
				87	500	
	AMCCOM	- 3710	DEVELOP MANUFACTURING TECHNOLOGY FOR 40MM CS MUNITIONS	87	450	36
	AMCCOM	- 3724	MFG PROCESSES F/LAP OF THE UNIVERSAL MINE DISPENSING SYSTEM	87	750	48
	AMCCOM	- 4078	UPGRADE SAFETY READINESS AND PRODUCTIVITY OF EXIST MELT POUR	84	621	49
				85	928	
	AMCCOM	- 4200	TNT CRYSTALLIZER FOR LG CAL	84	570	50
				85	235	
	AMCCOM	- 4373	SILK SCREEN DEPOSITION OF PRIMARY EXPLOSIVES	86	730	49
				87	1244	
	AMCCOM	- 4510	AUTO ASSY OF ADDITIVE LINER TO TANK CTG	84	484	49
	AMCCOM	- 4520	PRESS LOADING OF HMX COMPOSITIONS FOR TANK ROUNDS	84	589	49
				85	468	
	AMCCOM	- 4522	AUTO CARRIER CLEANING STATION FOR DET FAC	85	621	46
	AMCCOM	- 4524	LOW VOLUME AUTO MELT-POUR EQUIP FOR LOADING SMALL AP MINES	84	385	50
				85	332	
	AMCCOM	- 4561	FILL/CLOSE + LAP TECHNOLOGY FOR BINARY IVA MUNITIONS	86	314	50
	AMCCOM	- 4584	LOADING EQUIPMENT FOR CAL .50 AMMUNITION	85	650	50
				86	2010	
	AMCCOM	- 4596	PRODUCTION PROCESSES FOR CALIBER .50 PLASTIC BLANK AMMO	85	412	65
				86	3563	
				87	638	
	MICOM	- 3317	CASTING OF PROPELLANTS	87	350	200
MATERIAL HANDLING	AMCCOM	- D003	APPLICATION OF NEW INDUSTRIAL PROCESSES TO LAP TECHNOLOGY	86	600	46
				87	2700	
	AMCCOM	- 1701	BULK TRANSFER OF CHEMICAL MATERIALS	83	207	47

PROCESS	COMMAND	EFFORT	EFFORT TITLE	FY	COST	PAGE
	AMCCOM	- P124	ELECTROCHEMICAL REDUCTION OF DNT AND TNT ISOMERS	87	275	41
NITRATION	AMCCOM	- 4061	NITROGUANIDINE PROCESS OPTIMIZATION	83	640	58
	AMCCOM	- 4525	PRODUCTION OF HMX FROM A MODIFIED RDX PROCESS	85	480	39
				86	631	
				87	496	
PACKAGING	AMCCOM	- 4351	IMPROVED STORAGE TECHNOLOGY FOR PRODUCTION MACHINE	85	421	63
				87	319	
	AMCCOM	- 4229	ADVANCED PINK WATER TREATMENT	85	460	55
				85	343	
	AMCCOM	- 4298	EVALUATION OF DMN DISPOSAL ON HSAAP B-LINE	83	295	54
POLLUTION	AMCCOM	- 4348	NOISE POLLUTION ABATEMENT F/SCAMP IN LCAAP	87	264	54
ABATEMENT	AMCCOM	- 4489	ADVANCED POLLUTION ABATEMENT FOR DARCOM FACILITIES	83	86	55
				84	917	
				85	343	
	AMCCOM	- 4511	DISPOSAL OF FINAL SLUDGE FROM ACID RECOVERY OPERATIONS	83	582	55
				84	478	
	AMCCOM	- 4579	WHITE WATER RECOVERY SYS F/COMBUSTIBLE CASE MANUFACTURING	84	500	56
	AMCCOM	- 0923	VELOCITY TRAVERSE MAPPER FOR ANNULAR CHARCOAL FILTERS	85	354	
				86	400	
PROCESS	AMCCOM	- 1906	ADAPTIVE CONTROL OF EXPLOSIVES LINES	86	1430	40
CONTROL				87	2230	
	AMCCOM	- 4613	METHOD F/PROCESS ANALYSIS OF RDX/HMX SLURRY	85	319	40
				86	375	
	MICOM	- 3449	OPTIONAL PROPELLANT INGREDIENTS	83	150	200
				84	175	
	AMCCOM	- C003	INTERIOR SURFACE DECON SYSTEM	86	750	31
				87	700	
	AMCCOM	- D002	IMPROVED AUTOMATED LAP MATERIAL HANDLING TECH	86	550	50
				87	1500	
	AMCCOM	- P015	DEVELOP TECHNOLOGY FOR MFG OF DELAY TRAINS	86	250	46
				87	400	
PROCESS	AMCCOM	- 0904	CHEMICAL REMOTE SENSING SYSTEMS	84	2155	32
SELECTION				85	1696	
	AMCCOM	- 0924	MANUFACTURING PROCESS FOR GAS MASK CANISTERS	83	283	35
				84	1254	
	AMCCOM	- 2743	IMPROVED TECH FOR SMALL CALIBER AMMUNITION	86	500	63
				87	1000	
	AMCCOM	- 3036	INSENSITIVE HIGH EXPLOSIVES FOR LARGE CALIBER SHELLS (NEAK)	87	455	41
RECLAMATION	AMCCOM	- 4086	REPROCESSING EXPLOSIVE FINES AND DRILL SCRAP	85	850	49
	AMCCOM	- 4651	EXPLOSIVE RECLAMATION FACILITY	85	320	55
SAFETY	AMCCOM	- 2741	LIGHTNING WARNING SYSTEM FOR MUNITION PLANT SAFETY	86	150	61
				87	500	
	AMCCOM	- 4071	EXPLOS PREVENTION IN DRY DUST COLLECTION SYSTEMS	86	442	61

PROCESS	COMMAND	EFFORT	EFFORT TITLE	FY	COST	PAGE
	AMCCOM	- 4291	BLAST EFFECTS IN THE MUNITIONS PLANT ENVIRONMENT	85	347	61
	AMCCOM	- 4318	ENVIRONMENTAL IMPROVEMENT TO OSHA - NITRIC ESTER	85	100	62
				86	250	
	AMCCOM	- 4374	EXPLOSIVE SAFETY SHIELDS	85	225	62
SAFETY	AMCCOM	- 4453	PROPAGATION DISTANCE FOR ENERGETIC MATERIALS	83	213	62
				84	209	
				85	200	
	AMCCOM	- 4565	ULTRA HIGH SPEED FIRE PROTECTION SYSTEM	85	250	62
	AMCCOM	- 4617	EQUIVALENT DESIGN VALUES F/CLOSE IN APPLICATIONS	85	230	62
				86	150	
	AMCCOM	- 4621	FIRE SPREAD + CRITICAL HEIGHT CHARACTERIZATION	85	225	63
				86	225	
SEALING	AMCCOM	- C013	INTERMEDIATE DECON KIT	86	400	32
				87	200	
	AMCCOM	- 4368	DEVELOP AUTOMATED EQPT FOR SEALING M55 DETONATORS	85	795	45
SEPARATION	AMCCOM	- 4406	IMPROVE YIELD OF HMX DURING RDX NITROLYSIS	84	1998	38
	AMCCOM	- P001	LEAK STANDARDS FOR DOP PENETRAMETER TESTING	86	210	33
	AMCCOM	- P002	LEAK TEST STANDARDS FOR FILTER TESTING OPERATIONS	86	195	33
	AMCCOM	- P003	LEAK STANDARDS FOR PROTECTIVE MASK	86	250	35
TESTING	AMCCOM	- 3718	CONTINUOUS EVALUATION OF THE PROTECTIVE COATINGS	86	1800	59
				87	2100	
	AMCCOM	- 4423	ON-LINE MOISTURE ANALYZER FOR RDX/HMX MFG	86	410	39
	AMCCOM	- 4523	RAPID MOISTURE ANALYSIS OF EXPLOSIVE MIXES	84	200	45
	AMCCOM	- 4544	DEVELOP A THIRD GENERATION DYNAGUN TO SIMULATE TANK GUNS	84	416	58
				85	317	
	AMCCOM	- 0918	MODERNIZATION OF FILTER PENETRATION EQUIPMENT	84	700	34
				85	848	
				86	235	
TESTING, CHEMICAL	AMCCOM	- 0919	POLLUTION ABATEMENT FOR WHETERITE CHARCOAL	85	846	34
				86	487	
	AMCCOM	- 1295	MOD OF CHARCOAL FILTER TEST EQUIPMENT	83	218	34
				84	888	
				85	950	
				86	650	
	AMCCOM	- 4473	AUTO LEAK DETECTION OF WP MUNITIONS	84	410	60
				85	230	
				86	220	
WELDING	AMCCOM	- 0926	MMT FOR XM22 CHEMICAL AGENT ALARM SYSTEM	84	700	33
				85	1600	
				86	1900	
				87	600	

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				86	631	
				87	496	
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				87	519	
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				85	343	
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				84	917	
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	AMCCOM	- 4511	DISPOSAL OF FINAL SLUDGE FROM ACID RECOVERY OPERATIONS	83	582	55
				84	478	
	AMCCOM	- 4579	WHITE WATER RECOVERY SYS F/COMBUSTIBLE CASE MANUFACTURING	84	500	56
PROCESS CONTROL	AMCCOM	- 0923	VELOCITY TRAVERSE MAPPER FOR ANNULAR CHARCOAL FILTERS	85	354	
				86	400	
	AMCCOM	- 1906	ADAPTIVE CONTROL OF EXPLOSIVES LINES	86	1430	40
				87	2230	
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				86	375	
	MICOM	- 3449	OPTIONAL PROPELLANT INGREDIENTS	83	150	200
				84	175	
PROCESS SELECTION	AMCCOM	- C003	INTERIOR SURFACE DECON SYSTEM	86	750	31
				87	700	
	AMCCOM	- D002	IMPROVED AUTOMATED LAP MATERIAL HANDLING TECH	86	550	50
				87	1500	
	AMCCOM	- P015	DEVELOP TECHNOLOGY FOR MFG OF DELAY TRAINS	86	250	46
				87	400	
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SAFETY	AMCCOM	- 2741	LIGHTNING WARNING SYSTEM FOR MUNITION PLANT SAFETY	86	150	61
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SAFETY	AMCCOM	- 4453	PROPAGATION DISTANCE FOR ENERGETIC MATERIALS	83	213	62
				84	209	
				85	200	
	AMCCOM	- 4565	ULTRA HIGH SPEED FIRE PROTECTION SYSTEM	85	250	62
	AMCCOM	- 4617	EQUIVALENT DESIGN VALUES F/CLOSE IN APPLICATIONS	85	230	62
				86	150	
	AMCCOM	- 4621	FIRE SPREAD + CRITICAL HEIGHT CHARACTERIZATION	85	225	63
				86	225	
SEALING	AMCCOM	- C013	INTERMEDIATE DECON KIT	86	400	32
				87	200	
	AMCCOM	- 4368	DEVELOP AUTOMATED EQPT FOR SEALING M55 DETONATORS	85	795	45
SEPARATION	AMCCOM	- 4406	IMPROVE YIELD OF HMX DURING RDX NITROLYSIS	84	1998	38
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	AMCCOM	- P002	LEAK TEST STANDARDS FOR FILTER TESTING OPERATIONS	86	195	33
	AMCCOM	- P003	LEAK STANDARDS FOR PROTECTIVE MASK	86	250	35
TESTING	AMCCOM	- 3718	CONTINUOUS EVALUATION OF THE PROTECTIVE COATINGS	86	1800	59
				87	2100	
	AMCCOM	- 4423	ON-LINE MOISTURE ANALYZER FOR RDX/HMX MFG	86	410	39
	AMCCOM	- 4523	RAPID MOISTURE ANALYSIS OF EXPLOSIVE MIXES	84	200	45
	AMCCOM	- 4544	DEVELOP A THIRD GENERATION DYNAGUN TO SIMULATE TANK GUNS	84	416	58
				85	317	
	AMCCOM	- 0918	MODERNIZATION OF FILTER PENETRATION EQUIPMENT	84	700	34
				85	848	
				86	285	
TESTING, CHEMICAL	AMCCOM	- 0919	POLLUTION ABATEMENT FOR WHETERITE CHARCOAL	85	846	34
				86	487	
	AMCCOM	- 1295	MOD OF CHARCOAL FILTER TEST EQUIPMENT	83	218	34
				84	888	
				85	950	
				86	650	
	AMCCOM	- 4173	AUTO LEAK DETECTION OF WP MUNITIONS	84	410	60
				85	230	
				86	220	
WELDING	AMCCOM	- 0926	MMT FOR XM22 CHEMICAL AGENT ALARM SYSTEM	84	700	33
				85	1600	
				86	1900	
				87	600	

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* NON-METALS *
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PROCESS	COMMAND	EFFORT	EFFORT TITLE	FY	COST	PAGE
BONDING	AVRADCOM	- 7414	JOINING OF REIN THERMOPLASTIC COMPOSITE STRUCT	84	225	112
	AVRADCOM	- 7468	INTEGRATION OF ADVANCED REPAIR BONDING	84	515	107
	AVRADCOM	- 7493	ASSEMBLY LEVEL JOINING OF LARGE COMPOSITE STRUCTURES	86	290	112
	TACOM	- 6018	JOINING OF ATTACHMENTS TO CERAMICS	87	450	218
BRAIDING	AVRADCOM	- 7421	FILM RESIN IMPREGNATION OF BRAIDED HELICOPTER SPAR SECTION	86	90	124
	AVRADCOM	- 7473	FIBER REINFORCED THERMOPLASTIC STRUCTURES	87	150	110
CASTING	AMCCOM	- 0913	SPIN COATING OF DECON AGENT CONTAINERS	83	90	32
				84	164	
	AVRADCOM	- 7354	INTEGRALLY STIFFENED HELICOPTER TRANSMISSION CASE	87	1500	120
	AVRADCOM	- 7484	TITANIUM ALUMINIDE ENGINE COMPONENTS	86	300	129
				87	300	
	MICOM	- 3176	MANUFACTURE OF SILICON NITRIDE RADOMES	87	390	190
	TACOM	- 6029	MANUFACTURING PROCESS FOR METAL MATRIX COMPOSITES	86	500	222
				87	800	
COATING	AMCCOM	- 8464	OPTICAL COATING/MOUNTING PLASTICS F/MILITARY OPTICS	86	235	76
	AVRADCOM	- 7356	COATINGS FOR UPGRADING PERFORMANCE OF GAS TURBINE ALLOYS	87	115	130
	AVRADCOM	- 7392	RADIATION CURE OF ROTOR BLADES	87	150	123
	AVRADCOM	- 7400	ZIRCONIA SHROUD PRODUCTION SCALE-UP	87	300	126
	AVRADCOM	- 7410	SMALL ENGINE TURBINE SEAL OPTIMIZATION	87	330	130
	AVRADCOM	- 7459	MMT FOR IMPROVED HIGH TEMPERATURE THIN COATINGS	85	600	129
				86	500	
	MICOM	- 1134	RF/LASER HARDENING OF DOMES FOR DUAL MODE SYSTEMS	85	750	193
				86	750	
	TACOM	- 6107	IMPROVED MBT TRACK	83	1000	223
				85	625	
				86	1000	
COMPOUNDING	MICOM	- 1051	REPLACEMENT OF ASBESTOS IN ROCKET MOTOR INSULATIONS	83	280	198
				84	250	
CURING	AVRADCOM	- 7404	AUTOMATED CURE CYCLES	87	275	123
	AVRADCOM	- 7474	SINGLE CURE TAIL ROTOR	84	180	124
				85	60	
	AVRADCOM	- 7495	VACUUM IMPREGNATION OF LARGE COCURED COMPOSITE STRUCTURES	86	300	107
				87	500	
	MICOM	- 3343	FABRICATION OF INTEGRATED CASE AND GRAIN	87	750	198
CUTTING	AVRADCOM	- 7302	PROD OF TIB2 COATED LONG LIFE TOOLS	87	265	108
	AVRADCOM	- 7395	HAND HELD WATER JET CUTTING	87	150	113
	AVRADCOM	- 7478	THIN COMPOSITE LAMINATE CUTTING METHOD - AIRFRAME NON-METAL	87	235	108
DRAWING	MICOM	- 1020	MANUFACTURING PROCESSES FOR FUSED SILICA FIBERS	87	700	197
EXTRUSION	MERADCOM	- 3800	NON-GUM ELASTOMER HOSES	84	131	207
				85	342	
FORMING	AVRADCOM	- 7533	FIBER REINFORCED THERMOPLASTIC MATERIALS PRODUCTION	86	500	111
				87	200	
	MICOM	- 1122	PRODUCTION OF HIGH PERFORMANCE LOW COST CERAMIC IR DOMES	85	450	193
				86	350	

PROCESS	COMMAND	EFFORT	EFFORT TITLE	FY	COST	PAGE
FORMING	MICOM	- 1137	IMPROVED INFRARED TRANSMITTING DOME FOR ARMY MISSILES	86	1200	194
				87	1400	
	TACOM	- 5053	MANUFACTURE OF ENGINE COMPONENTS OF CERAMIC	83	670	217
				84	750	
				85	750	
GENERAL	AVRADCOM	- 7022	PDN OF POLYPHOSPHAZENE FIRE RESIST HYDRAULIC FLUIDS	86	220	121
	AVRADCOM	- 7418	COMPOSITE ELECTRO-OPTICAL SYSTEM(EOS)	87	800	114
	AVRADCOM	- 7462	IMPROVED AIRFRAME MANUFACTURING TECHNOLOGY	85	1000	106
				86	3000	
				87	2000	
	DARCOM	- 5052	ARMY ENGINEERING DESIGN HANDBOOK FOR PRODUCTION SUPPORT	83	120	176
				84	720	
				85	750	
				86	600	
	MICOM	- 1136	FIELD/DEPOT REPAIR OF COMPOSITE MOTOR COMPONENTS	86	500	199
				87	500	
IPIP	AVRADCOM	- 7427	ATTACK HELICOPTER PRODUCTIVITY IMPROVEMENT (API) PROGRAM	83	1500	121
				85	3000	
				86	1000	
				87	1000	
	AVRADCOM	- 7429	INDUSTRIAL PRODUCTIVITY IMPROVEMENT PROGRAM- UH-60 BLACKHAWK	85	2500	122
				86	1000	
				87	1000	
	AVRADCOM	- 7442	INDUSTRIAL PRODUCTIVITY IMPROVEMENT PROGRAM	85	1500	122
				86	1000	
				87	1000	
	AVRADCOM	- 7449	INDUSTRIAL PRODUCTIVITY IMPROVEMENT PROGRAM- RPV	86	1000	122
				87	1500	
	DESCOM	- 2002	LONG RANGE DEPOT PRODUCTIVITY IMPROVEMENT PROGRAM - LEAD	84	1700	153
				85	700	
	TACOM	- 6090	TOOELE ARMY DEPOT PRODUCTIVITY IMPROVEMENT PROGRAM	84	1800	221
				85	2000	
				86	650	
				87	500	
LAY-UP	AVRADCOM	- 7293	MOLDED WAVEGUIDE PARTS FOR ANTENNAS	87	350	114
	AVRADCOM	- 7385	COMPOSITE ENGINE INLET	87	350	110
	AVRADCOM	- 7456	LOW COST TOOLING FOR AIRFRAME AND ROTOR COMPONENTS	85	500	108
				86	1250	
				87	750	
	AVRADCOM	- 7465	ADVANCED COMPOSITE SENSOR SUPPORT STRUCTURE	83	300	106
				84	515	
				85	195	

PROCESS	COMMAND	EFFORT	EFFORT TITLE	FY	COST	PAGE
	AVRADCOM	- 7488	FAST FLOW MANUFACTURING OF COMPOSITE MATERIALS	85	500	107
				86	2500	
LAY-UP	AVRADCOM	- 7494	POLYIMIDE ENGINE COWLINGS	86	290	107
	AVRADCOM	- 7496	INTEGRATED TECHNOLOGY ROTOR	86	1500	124
				87	3000	
	AVRADCOM	- 7513	AUTOMATED COMPACTION OF COMPOSITE LAYUPS	87	300	113
	AVRADCOM	- 7359	POLYIMIDE FOAM FOR MULTIFUNCTIONAL AIRCRAFT STRUCT	87	175	112
	AVRADCOM	- 7374	BI-MATRIX CARBON-CARBON STRUCTURAL COMPONENTS	87	450	111
	AVRADCOM	- 7383	USE OF MOLDED PLASTIC HARDWARE IN TWO AXIS DRY GYROSCOPES	84	165	115
				85	300	
	AVRADCOM	- 7390	FIBER REINFORCED THERMOPLASTIC STRUCTURE	87	350	110
MOLDING	AVRADCOM	- 7406	REINFORCED THERMOPLASTIC CONTROLS	87	225	114
	TACOM	- 5038	NON-PNEUMATIC COMBAT TIRE FABRICATION TECHNIQUES	86	300	222
				87	400	
				85	225	
	TACOM	- 5064	LIGHTWEIGHT SADDLE TANK	83	125	216
	TACOM	- 5075	RUBBER FOR MILITARY TRACK	83	250	222
				87	350	
				86	250	
	TACOM	- 6000	LIGHTWEIGHT TILT-UP HOOD/FENDER ASSEMBLY	84	510	216
				85	200	
	AVRADCOM	- 7344	RIM URETHANE MOLDING FOR SECONDARY STRUCTURES	84	175	110
				85	225	
	AVRADCOM	- 7519	ADVANCED THERMOPLASTIC COMPOSITES	86	300	110
				87	325	
MOLDING, INJECTION	AVRADCOM	- 7524	LOW COST MILLIMETER WAVE COMPONENT PRODUCTION	86	125	115
				87	280	
	MICOM	- 1138	MOLDED PLASTIC NOZZLE FOR 2.75 INCH ROCKET	85	580	200
				86	400	
				87	175	
	DESCOM	- 4008	RUBBER INJECTION MOLDING OF ROADWHEELS	87	550	154
	TACOM	- 6123	CERAMIC TURBOCHARGER ROTOR	85	250	218
				86	250	
	AVRADCOM	- 7004	MFG TECHNOLOGY FOR ROTOR ITEMS AND ASSOCIATE COMPS	87	100	125
	MERADCOM	- 3804	COMPOSITE BOTTOM CHORD FOR MILITARY BRIDGES	85	960	207
				86	1100	
				87	400	
PROCESS SELECTION	TACOM	- 4001	MANUFACTURING FOR CORROSION PREVENTION IN TACTICAL VEHICLES	84	595	216
				85	2070	
				86	725	
				87	500	
	TACOM	- 5042	MANUFACTURING TECHNIQUES FOR NON-METALLIC TOTAL VEHICLES	85	250	216
				86	250	
				87	250	

PROCESS	COMMAND	EFFORT	EFFORT TITLE	FY	COST	PAGE
SINTERING	AVRADCOM	- 7350	CERAMIC COMPONENTS FOR TURBINE ENGINES	84	1650	126
				85	2660	
				87	3070	
	TACOM	- 6019	GRAIN BOUNDARY IMPROVEMENT PROCESSING FOR CERAMICS	86	220	218
				87	420	
WEAVING	MERADCOM	- 3802	HIGH STABILITY TRUSS CHORD	87	500	207
	MICOM	- 1080	LOW COST CARBON/CARBON NOSETIPS	86	550	199
	AVRADCOM	- 7193	ADVANCED FILAMENT WINDING FOR AIRCRAFT COMPONENTS	87	350	111
	AVRADCOM	- 7382	LOW COST COMPOSITE MAIN ROTOR BLADE FOR THE UH-60A	83	446	123
				84	2235	
	AVRADCOM	- 7384	PDN OF COMPOSITE PITCH HOUSING	84	650	120
				85	550	
				86	400	
	AVRADCOM	- 7387	LOW COST RADAR CAMOUFLAGE MATERIAL	87	100	106
WINDING	AVRADCOM	- 7393	PROD OF COMPOSITE PITCH HOUSING	86	150	119
				87	150	
	AVRADCOM	- 7467	ADVANCED COMPOSITE ROTOR HUB	85	2000	124
				86	1220	
				87	1400	
	AVRADCOM	- 7511	PRODUCTION OF CH-47 AFT ROTOR DRIVE SHAFTS	87	500	119
	AVRADCOM	- 7517	COMPOSITE HUB PRODUCTION	87	600	125
	AVRADCOM	- 8139	COMPOSITE MAIN ROTOR HUB	87	750	125
	MICOM	- 1082	HIGH ANGLE TAPE WRAPPED HEATSHIELDS	87	900	197
	MICOM	- 1087	APPLICATION OF COMMERCIAL GRADE KEVLAR TO ROCKET MOTOR COMP	85	400	199
	MICOM	- 1089	INTEGRAL ROCKET MOTOR COMPOSITE POLE PIECES AND ATTACHMENTS	84	350	199
				83	325	
				85	350	
WINDING, STRIP	MICOM	- 1126	WOUND ELASTOMER INSULATOR PROCESS	83	325	199
				84	450	

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* TEST & INSPECTION *
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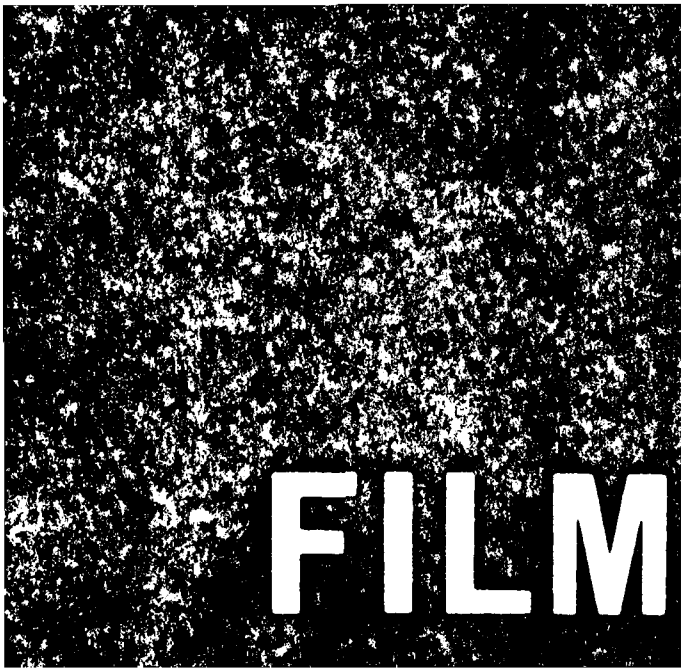
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